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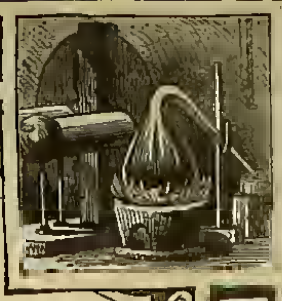

SCIENTIFIC AMERICAN

ARCHITECTS AND BUILDERS EDITION.

Vol. III.

JANUARY—JUNE,

1887.

MUNN & CO., PUBLISHERS,

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INDEX.

VOLUME III.—JANUARY–JUNE, 1887.

Articles Marked * are Illustrated.

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ARCHITECTS AND BUILDERS EDITION.

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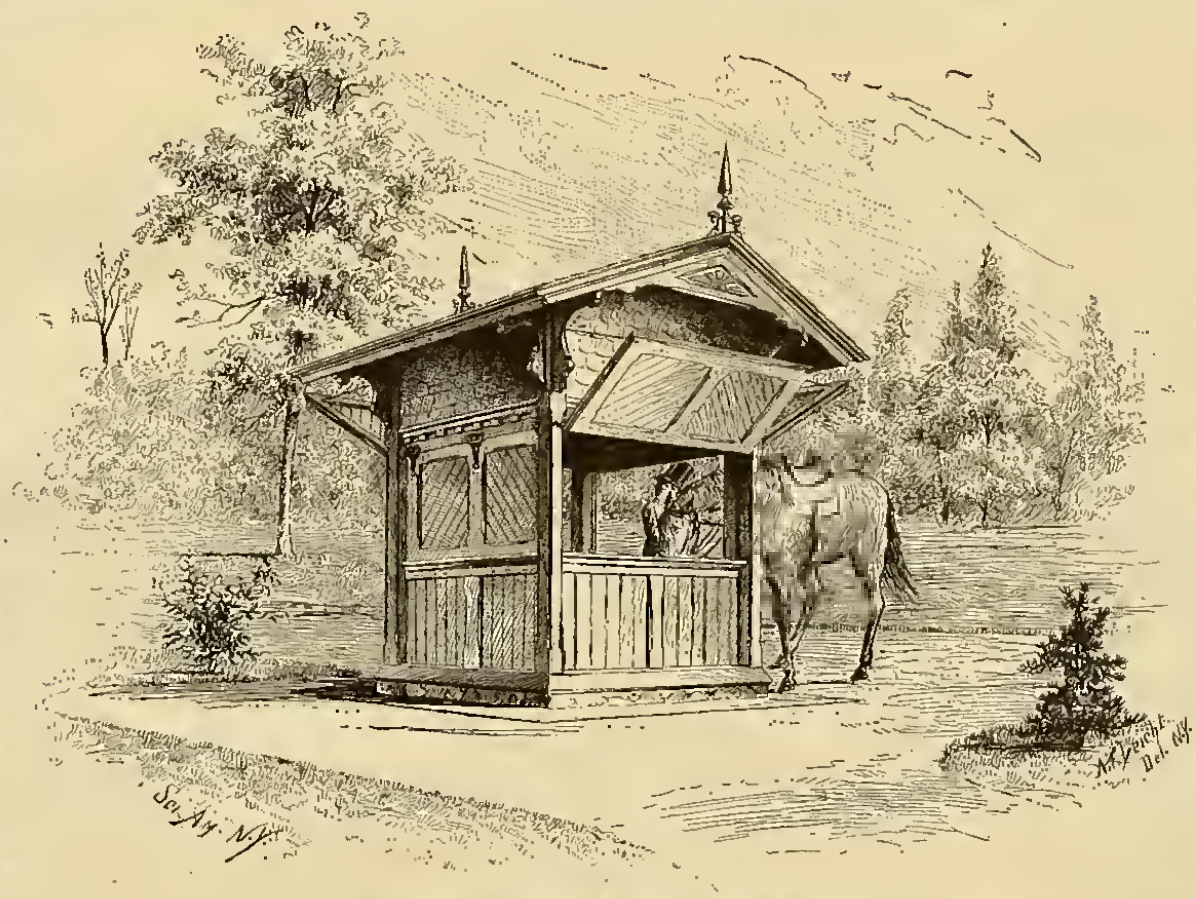
A DRINKING FOUNTAIN.

Designed for J. B. Dutcher, Esq., Pawling, N. Y., by B. J. Schweitzer, architect, Lawrence Building, 84 West Broadway, New York.

The structure is so arranged and fitted up with doors that, by the exercise of a little care, the tank and pipes can be kept from freezing in the coldest weather. The doors, opening upward and operated by weights and pulleys, act as an awning and shade, thus aiding and keeping the water cool in warm weather. This makes it a suitable, profitable, and attractive invention for parties who keep cattle and horses. The tank and all pipe fittings were put in by Mr. A. J. Corcoran, of 76 John St., New York, and are connected with his improved windmills and system of waterworks.

Drawings by Mail.

One of the matters which we hope will engage the attention of the Convention of the American Institute of Architects is the provision of better and cheaper facilities for the conveyance of drawings by mail. At present, by a ruling of the Postmaster-General, drawings and tracings must pay letter postage; and where drawings are sent in pasteboard cylinders, or on wooden rolls, as is absolutely necessary to preserve them from the rough handling of the letter carriers in cities, the cost of forwarding them by mail, although only one-half of what it was in 1885, is still very considerable, especially as compared with that of sending parcels of merchandise or printed matter; and architects are in consequence usually obliged to intrust their plans to the express companies, which, in country towns, are apt to be slow and uncertain in delivery. Even where an architect, for the sake of having his drawings transmitted through the most direct and recognized channel, goes to the expense of sending them by mail, he is, under the present system, by no means sure that they will arrive safely, and he has no redress against the Government in case of their loss or destruction. Most of us have had repeated experience of the loss of plans in the mails, and we remember one occurrence, more annoying, if possible, than the total loss of such property, where a city letter carrier, to save himself the trouble of taking upstairs a valuable plan, which, unfortunately, had not been rolled on a cylinder, deliberately crumpled it up and pounded it until he could force it through a half inch slit into a little letter box in the hallway of the building where he was to deliver it, and there it was discovered, some weeks later, after a great deal of time had been spent in trying to find what had become of it. Our post office system is none too good, in any case, but we rarely hear of losses of merchants' samples, or other things of the kind, which pay for transportation only a small fraction of the tax levied on architects' drawings; and so long as architects pay exorbitant rates for such service, they are certainly entitled to demand that it should be done with decent care and dispatch. The fact is that in the whole matter of transmission of parcels our post office is at least twenty years behind that of any other civilized country. In England, France, or Germany it is now as common to take a box or parcel to the post office for forwarding as it is with us to mail a letter. Anything, not dangerous to other property carried with it, is accepted, prepaid by stamps at what seems to us an absurdly low rate, and sent by the next mail, and delivered to the consignee. There is a limit to the size of the parcels received, but in England anything can be sent, we believe, which does not exceed seventy pounds in weight, or which does not measure, by adding the length to the girth, more than six feet. As these limitations admit a trunk of tolerable size, nearly all the transportation for private individuals which with us is done by the express companies, inconveniently and expensively, is there carried on by mail, and the service is so efficient and profitable, even at the low rates charged, that the various European countries are at this moment actively engaged in arranging for the extension of the "parcel post" to include service from one country to another. Here, as each nation has its own custom house regulations, it is necessary to provide for examination at the frontier and for the collection of the duties, but this has been successfully arranged, and the international parcel post is already in operation between England and Belgium, and will, according to the official announcement made last summer, be very soon extended to Germany and Holland, if it has not been already established. Between England and her colonies packages of merchandise have been transmitted by mail for some months, at rates which must make Americans who do not own stock in express companies rather envious. The last parcel which came to us across the ocean was a box, about fourteen inches cube, containing some books, and the bill for transportation from Liverpool was about five dollars. The same parcel, if we understood correctly the tariff of rates of the colonial parcel post, which we saw in various places in England, would be carried from any post office in England to any post office in New Zealand, and delivered to the consignee, for thirty cents. Now, New Zealand is exactly on the opposite side of the earth from London, and the distance, by the shortest mail route, is about fourteen thousand miles; and if the English mail steamers are glad to carry such a box fourteen thousand miles for thirty cents, it would seem as if a charge of five dollars for conveying a similar box, in the same steamer, less than one-fourth of the distance, must allow, to say the least, a considerable margin of profit. In a less degree the same discrepancy in cost between having a thing done on a great scale for the public benefit and on a small scale for private profit is to be observed in inland transportation, and it is quite time that the people in this country, out of whose pockets comes the difference, should have the benefit of such economies as are now in operation elsewhere. Although architects do not have to pay out a very large portion of their substance for the carriage of their plans, their express and postage bills generally amount to a very respectable sum by the end of each year; and as they have the advantage of being able to speak their minds through the deliberations of a highly respected organization, representing all portions of the country, whatever they might say on the subject would be sure to command attention.—*Amer. Architect.*



DESIGN FOR A DRINKING FOUNTAIN.

Asphaltum Pavement.

The best pavement in Philadelphia is the asphaltum pavement around the City Hall. It was laid in September, 1884, cost no more than Belgian blocks, and is as perfect as when put down. It is as noiseless as a macadamized road, smoother than the smoothest floor, and affords an excellent surface for horses' feet. It is easy to clean, handsome, impenetrable to water, and resists the torrid zone of August and the lowest winter temperature perfectly. It requires hardly any repairs, and does away with the necessity for "crossing stones," as it is itself equal to any sidewalk. It is vastly better than a cobblestone pavement, which allows mud to ooze up with every rain, grass to grow in all the crevices, and requires constant repairs on account of settling. It surpasses Belgian blocks, for they are noisy, hard upon vehicles and horses in winter and summer, and are not easy for foot travel. None of the other alleged improved pavements, like the wooden pavements of Chicago, the hard firebrick pavements of Steubenville, or the "composition" pavements in vogue in some of the smaller New England cities, possesses the excellent properties of this asphaltum pavement about the City Hall, and it was not laid under the most favorable conditions. As it has answered so well where it is, it should be tried on other streets. Let it be further tested at points of heavy travel in the business portions of the city. While it would not be advisable to take the results up to this time, satisfactory as they are, as conclusive, they certainly warrant the expenditure of money in thoroughly determining upon the value of a street pavement that seems the best now in use in Philadelphia.—*Philadelphia Daily News.*

Gluing.

Experienced woodworkers have always contended that a glue joint, properly done, is stronger than the wood itself. And yet joints often give way at the surface where the glue is used, which is accounted for by bad material. A similar reason is frequently the true cause, which few artisans wish to acknowledge. It is merely that skill is lacking. In gluing wood, it is asserted by competent authority that bad work is produced by applying glue to both surfaces. A good job is secured by applying the glue hot, but not extremely so, to one surface, which should be cold, while the other surface should be heated at the stove, but should have no glue upon it. By this method the glue will permeate the wood, and bind the surfaces together firmer than nature binds the fibers. It is said by good cabinetmakers that if these precautions are taken, less difficulty will be found with glues which, skillfully handled, usually will do the work required of them.

AMERICAN PAINT.—There are now sold in the United States about $250,000,000 worth of paints every year, and raw materials to the amount of half this sum are consumed in making them. Putty is made by all the big paint factories. It is made out of whiting and the skin of linseed oil. It is put up by the thousands of tons in kegs and skins, and costs about a cent and a half a pound to make it.

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Back Numbers.

At present we are able to supply to new subscribers the back numbers of this journal from its beginning in November, 1885. Each number is accompanied by a sheet of colored plates and a sheet of details.

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THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

The twentieth annual convention of the American Institute of Architects was opened on Dec. 1, in this city, by the president, Thomas U. Walter, of Philadelphia. He defined architecture as a science in which the good, the true, and the beautiful predominated in all its relations, and regarded the philosophy of taste as indispensable to a successful practice of the profession. Social and fraternal relations were to be promoted, on the ground that knowledge of each other would engender respect and create a truer feeling for art.

He believed that the ennobling and elevating character of an architect's profession should carry him above all petty rivalries and animosities. Confessedly not doing so, the results must be ascribed to the inherent weakness of all human endeavors.

The evidences of progress in the growth of taste and the improvement observable in the general character of buildings erected during the current year, or which are in process of erection, were briefly noted.

Great changes have taken place in the ornamental character of brick and stone work, chiefly the former, and these changes had imparted to modest as well as pretentious buildings, an unmistakable element of taste and refinement. The widespread satisfaction at this state of things is an omen of promise.

The home building instinct of the American people, which fortunately is not a race impulse, has spread its protecting and ennobling influence over the land, and is animated with that insatiable vigor which marks this nation as exceptional.

Wherever terra cotta decorations in brickwork have been tastefully and harmoniously applied, they have imparted an artistic effect. Like many other meritorious accessories, however, its usefulness has been impaired by its abuse.

The popular idea that comfort, convenience, good taste in design, and carefully studied construction are synonymous with costliness is due solely and wholly to an insufficient knowledge of the subject. The tendency of the day is to cheapen construction by every legitimate appliance and device. The apparent cost of a patented invention is more to be found in the name than in the reality. The desire to obtain a ten thousand dollar house for eight thousand dollars is a proverbial weakness of the human race, but the difficulty is to secure from the individual the admission that he himself shares this weakness. The distress that this want of frankness causes is too well known to be discussed.

The fact remains evident that many a plain and unpretentious house shares equally with its palatial namesake the every comfort and refinement of a home.

The growth of taste is admitted. The Queen Anne prettiness is acknowledged to be pretty, but it lacks character and a reason for being what it is, and it is passing away like a fashionable folly. The unrivaled richness of the French Renaissance is confessedly too ornate for our simpler tastes. It smacks of the wanton luxury of French courts, and it has about as much sincerity as an appanage of the court of Louis XIV. Its use is now confined to interiors, where it may in all candor remain, a true expression of the artistic thought of a by-gone day of splendor and excess.

We would catch the spirit, the immortal grace, of every style and period, but we shall accomplish more by endeavoring to utter the principles of their being than by trying to adapt their mere outline of forms and pomp of circumstances to our widely different and variable conditions.

It is observed with pleasure by all true art lovers that the effete forms and constructions of by-gone ages are passing away. The traditions of the past remain with us to guide us in our endeavors.

Because of the conditions which gave it birth and ally it more closely to our time than to that of any other epoch, the resources of mediæval art are being studied with an eagerness and a scientific spirit belonging to the art itself that are commendable wherever the name of art is revered.

The great distances which separate the art centers of the country are gradually being drawn together by means of auxiliary architectural societies, sketching clubs, and annual exhibitions.

The United States now contains thirteen distinct architectural associations, connected in one way or another with the parent organization.

The improvement in the advancement of architectural art and the sciences related to it is due largely to the united work of these organizations.

The Institute is steadily growing in numbers and influence, and constant applications are received from men of prominence in the profession to join its ranks. It now consists of 191 professional members, of which 97 are fellows and 94 associates.

The objects of the association are to unite in fellowship the architects of this continent, and to combine their efforts so as to promote the artistic, scientific, and practical efficiency of the profession.

The questions naturally arise, How are they promoting the efficiency of the profession? and In what manner are they administering to the public good?

It is the policy of the Institute to establish chapters, or auxiliary organizations, in all of the leading cities, or wherever the number of members will warrant their establishment. In Philadelphia for instance, social meetings are held monthly at the residence of some member, ideas are exchanged on all cognate topics, and the good of the profession is practically and artistically promoted.

One of the most powerful influences for the public good is manifested through the work of the committee on education. The first college in the country to establish a course of study in architecture was the Institute of Technology, at Boston, followed by Cornell University, at Ithaca, N. Y., and the School of Mines of this city. Western colleges are instituting similar courses, and the means for acquiring a good foundation for an architectural career are on a substantial basis.

In this connection it is well to mention the work which the people through their own agent, the Bureau of Education, at Washington, are doing for themselves. A series of pamphlets, called "Circulars of Information," are published for distribution among teachers, physicians, engineers, architects, and to all who are interested in the cause of education. Their matter relates largely to the art and science of school building, planning, hygiene, and management. They are written by specialists eminent in their field, and indeed some of these men, in the unassuming pamphlets, have recorded the highly valuable work of a life-long research on these lines of study.

The vast improvement everywhere noticeable in the character of our school buildings must be attributed, to some extent, to the information contained in these circulars.

(To be continued.)

HOW NOT TO DO IT

Seems to be the aim of many architects and builders of the present day. Formerly, houses were built in a thorough manner, with heavy timbers, closely fitted together with mortise and tenon and strongly braced, so that when completed the building was substantial and durable. How different in these respects are the houses which are now being constructed all about us! A partial description of one now being built near the writer's residence will suffice for an illustration. It was begun under contract to be finished and ready for occupancy November 10. Its cost to be $3,500. The foundation wall, instead of resting upon a bed of concrete twelve inches thick, below the level of the cellar bottom, is placed at once upon the ground, laid up in a burried manner without cement, and without any filling up of the interstices between the stones with mortar. Upon this poorly constructed foundation are placed 2×10 timbers for the sills, laid down on the flat, the ends of which are notched out to the thickness of one inch, and then nailed together. Upon this flimsy base the uprights are placed, none of them being larger than 2×4, except the corners, which are 3×6. The horizontal pieces are two, 2×4, nailed together, and this, too, over windows and doors, where considerable weight will have to be sustained. This same lightness of material is seen throughout the entire frame and rafters. These are fastened together with the least possible number of nails. In this way several thousand feet of timber and many days' labor are saved to the contractor. This frail frame is, of course, much strengthened by the sheathing boards which follow, but even these are often put on *horizontally*, instead of *diagonally*, as the latter method takes more time and material. The floor beams are bridged in the flimsiest manner, the contractor relying for the bracing upon the flooring boards laid upon them. The same principle of "how not to do it" thoroughly is carried through the entire structure as to the mason work, the plumbing, and the tin work—especially in the last two—so that the house, when done and ready for occupancy, will be after all a mere shell, to shake in every wind, to leak in every rain storm, and to freeze its unfortunate occupant in all cold weather. It will doubtless, to the casual observer and, perhaps, to the coming tenant, look well, inviting, and to all appearances as good as any other better built house. One year's occupancy, however, will dispel all delusions, and show to the owner that it is but a sham, and he will be appalled at the prospect before him of necessary repairs. His investment will be found unprofitable, and perhaps his tenant leave the premises in disgust at country built houses in general. The pertinent question now is, How does this state of things come about? It happens in this wise: The owner desires to invest a certain amount of money, and tells his architect that this is his limit, and that it must not be exceeded, and yet for this sum he must have a house with an attractive exterior and a given number of rooms of goodly size. The architect endeavors to comply, and, so that his task may not be impossible, he draws the specifications so that a contractor may be found who will undertake the construction of the building for the price named by the owner. He, in his turn, to get out whole under existing diffi-

culties with skilled labor, the bigb wages, and short hours, studies most diligently *how not* to put in anything, either of time or material, that can be omitted. A watchful contractor has always the advantage over the owner, who probably is trustful and possibly often absent. Thus it will be seen that owner, architect, and contractor are each and all responsible for the effort of "how not to do it" as it ought to be done. The first, in not recognizing the principle that a good article cannot be had without correspouding cost; the second, for complying with the unreasonable demand made upon him, and which he knows will result in the end with only dissatisfaction to all concerned; and the last, for willingly undertaking a work of such importance to healtb and moneyed interest as the building of a house, when be knows he must scimp everywbere, to the verge of dishonesty, in order to save himself from loss. The *result* is that everywhere about us are seen these flimsy, poorly constructed houses, alike detrimental to tbe profit of the owners' investments and tbe comfort of the occupants. A well constructed house, even if it does cost more at the first, proves always the better investment, for the extra cost is more than saved in the absence of future repairs, to which, in a house badly built, there is no end.

AN EIGHTEEN HUNDRED DOLLAR COTTAGE.

The following relates to the cottage illustrated in our colored plate given in our last (December) number:

The design is an excellent example of the possibilities developed hy the prevailing demand for cheap and, at the same time, convenient and attractive cottages. Tbis building can be erected and fully finished complete at a total cost of $1,800, and tbe accommodations will be found to compare favorably with many houses of a mucb greater cost. The rooms are all of ample size and of convenient access and communication. Ample provision is made for closet accommodations, etc., and a cellar extends under the entire building.

The construction may bc briefly summed up as follows:

The cellar and foundation walls are to be built up with good building stone, laid in lime and cement mortar. The frame is to be constructed with good hemlock timber, of the following dimensions, viz.: Sills, posts, plates, and girts, 4 in. x 6 in. First and second tiers of floor joists, 2 in. x 10 in., 16 in. on centers; attic joists, 2 in. x 8 in., 16 in. on centers. Door and window studs, 3 in. x 4 in.; partition studs and nailing joists, 2 in. x 4 in. and 3 in. x 4 in., 16 in. on centers. Rafters, 2 in. x 6 in., 2 ft. on centers.

The frame is to be sheathed with millworked hemlock boards, which are to he covered with best sheathing felt, and the exterior finished with shingles and siding, as shown. The roofs are to be sheathed with shingling strips, and covered with best No. 1 pine sawed shingles.

The interior finish is to bc neat and simple. The floors are of millworked white pine of medium width. The walls are hard finished. The doors, hardware, etc., are first class throughout.

The alternative exterior, given in elevation on the supplementary sheet given in December, can be carried out for about $1,200.

Horace G. Knapp & Co., arcbitects, of 176 Broadway, New York city, are the authors of the design.

ST. JAMES' RECTORY, FORDHAM, N. Y.

About two years ago, the rectory attached to St. James' Church at Fordham, N. Y., was erected for the Rev. C. J. Holt, from tbe designs of the eminent architect, Edward A. Sargent, Esq., of No. 55 Broadway, N. Y. city. We give with this number a colored plate and a sheet of very useful details of this handsome residence.

Examined either from the standpoint of an architectural production or from that of the more practical view of the occupier, the design cannot be considered to bc otherwise than a very satisfactory one. The artistic treatment of the details and the bappy choice in colors make the whole effect very pleasing.

Stone of a light brown tint has been used for the lower portions of the walls, and in tbe positions marked in black upon the plan in colored plate. The chimneys are built of pressed brick, and the upper portion of the building is shingles and clapboards. The roof is shingled, and terra cotta panels are used in places.

In the plan of the bouse we have a somewhat unusual arrangement, in the manner of placing the kitchen and servants' apartments. By building them at an angle, tbey are kept distinct from the remainder of the house, entirely doing away with the noise and smell inseparable from tbe use of a kitchen. At the same time, the close proximity of the dining room renders the arrangement a good one for serving. On the ground this manner of planning appears by no means awkward, but rather tends to increase tbe apparent size of the house.

There is a fine hall and open staircase, finished in polished oak, and a large oriel window on the second floor, forming a balcony and being richly ornamented with cathedral glass. The details of this window are shown in our supplementary sheet.

A very pleasing feature in the house is the number of comfortable corners provided. Thus, in the dining room we have a corner seven feet by nine feet, inclosing the fireplace and forming a very cozy position. In the library is another snug corner in tbe hay. Stained glass is used for the transom lights in many of the rooms, witb excellent effect.

In the parlor, library, dining room, and hall are open fireplaces with tile heartbs, tiled mantels, and brigbt brass borders, fenders, and dogs. Over-mantels of special design are provided, that in the parlor being constructed of cherry and those in the other rooms of polished oak. Each is fitted with beveled edge mirrors and stained glass ornamental work.

The hall and dining room are finished with ceilings of hardwood, paneled and ribbed, and the floor of the latter is laid diagonally in narrow widths around the border. The ceilings of the otber rooms are plastered and have deep cornices. The doors, bases, and trim generally are of pine, stained a light color, and varnished in the main rooms and oiled in the upper floors.

Electric bells hot and cold water, and gas are laid throughout the house. The kitchen is fitted with Barstow's "Improved" range.

The cost of the house in its present condition was about $11,000.

A DWELLING OF MODERATE COST AT RUTHERFORD, N. J.

The perspective drawing and plans shown on the colored plate presented with our present issue, and tbe accompanying sheet of details of construction form, with the specification below, a complete set as prepared by Mr. B. J. Schweitzer, arcbitect, of No. 84 West Broadway, New York city, for the erection of a two story dwelling at Rutherford, N. J., for Mr. A. F. Garnier.

The design has been carefully considered with the view of providing a comfortable and convenient house at a moderate cost. The whole arrangement is a successful one in the cozy and snug appearance it presents and the attractive and appropriate elevation provided.

While keeping the cost strictly within moderate bmits, the architect has employed only the best materials and construction, as will be apparent on reference to the specification.

The sheathing is of dressed hemlock boards, and is put on diagonally, and the roof is covered in with Bangor slates of a dark color, prodncing a very good effect.

Mr. Scbweitzer has had a very extended experience in designing all descriptions of houses. In Rutherford, N. J., alone he is responsible for over a hundred buildings, while at Passaic and various other places on the Erie be is well represented by his characteristic work. His fifteen years' labor in New York and its vicinity has made him well knowu as a careful architect of originality and assiduity.

SPECIFICATION.

EXCAVATIONS.

Cellar.—To be under the wbole bouse, 3 ft. 6 in. deep.

Cesspool.—To be 7 ft. in diameter and 8 ft. deep, built where directed.

Cistern.—To be 8 ft. in diameter and 10 ft. deep, built where directed.

Trenches.—For pipes to be at least 2 ft. 6 in. below the surface.

Piers.—All outside piers to be at least 2 ft. 6 in. below the surface. All inside piers 6 to 8 in. below the cellar bottom.

Privy Vault.—To be 4 ft. 6 in. long, 4 ft. 6 in. wide, and 4 ft. deep, built where directed.

Grading.—Clean up the entire premises of all rubbish, and grade off earth around the house as directed.

MASON'S WORK.

Cellar Walls.—Up to the surface level, to be 18 in. thick, of Bellevilie quarry stone, laid in good lime and cement mortar. All to be bonded and pointed complete. Above the ground build a hard brick wall, 8 in. tbick, laid flush with the inside of stone wall, in good lime and cement mortar. Point up complete.

Piers.—Build all piers of good, hard brick, laid in lime and cement mortar, and point up complete.

Chimneys.—Build chimneys as shown on plans, of good, hard bricks laid in lime and cement mortar; strike all joints on the inside and outside. Provide each room with a stovepipe hole, collar, and thimble, and cap them with a bluestone 1½ in. thick. Build the fireplace in kitchen for range, and furnish and set a bluestone hearth rubbed smooth, also a rubbed bluestone lintel, all complete. The jambs in the kitchen to be nicely pointed and laid up in select Hackensack brick.

Outside Cellar entrance to have bluestone copings and steps.

Cistern.—To be bricked up witb good, hard brick, laid in cement mortar. An arch is to bc sprung over the top, with a manhole and bluestone cover.

The inside is to be thoroughly cemented, and warranted water tight. The same is to have an overflow pit, and is to be connected with pipes from all leaders.

Cesspool.—To be stoned up dry in usual manner.

Privy Vault is to he stoned up dry in usual manner.

LATHING AND PLASTERING.

All walls and ceilings on first and second floors are to be lathed with spruce lath, and plastered two best coats of tempered mortar, and then hard finished hard and white.

CARPENTER'S WORK.

Timber.—All timber is to be of best quality hemlock. Corner posts, plates, and interties to be mortised and tenoned together, all 4" x 6".

All angles are to be braced with long braces.

First and second floor beams, 2" x 9", attic floor beams 2" x 8", all placed 16 inches from centers, and bridge all in a thorough manner, as directed.

Double all beader and stringer beams.

All wall strips 2" x 4"; all openings to be studded with 3" x 4".

Rafters 2" x 8", placed 20" from centers.

Sheathing.—Cover the entire frames witb dressed hemlock boards, put on diagonally, and put on resin sized sheathing paper over the hemlock boards.

Siding.—Cover tbe entire house, from sill to plate, as per drawing, with No. 1 narrow lap siding.

Shingles.—Cover the gables and lean-to over the piazza with regular sawed round and square butt shingles of California redwood, laid 6 inches to the weather.

Trim Corner Boards, Window Casings, and Water Table, 1¼" best white pine. Main cornice all as per detail, of best white pine; also piazza trim, cornice, columns, and rails of best white pine.

Roofs.—All main roofs are to be covered with best Bangor slate in best manner. The ridges are to be coped with galvanized iron and made perfectly water tight.

Bay window and porch on rear are to he tinned with best I. C. tin.

All gutters are to be tinned with best I. C. tin, to conduct all water through 3" leaders.

Windows.—All sashes to be 1½" thick, glazed with double tbick French sheet glass. The upper sashes are to have marginal lights filled with cathedral glass.

Furnisb all with the "Ives" sash fastener, complete, and hang all sashes on cord weights and pulleys.

Blinds.—All windows to have outside blinds, hung in pairs, on New York wrought iron hinges, and all to be furnished with proper fastenings.

Doors.—Cellar doors to he of heavy spruce dressed, hung on hook hinges and furnished with lock. Front doors 1¾ in. thick, moulded as per drawing, hung on 4 in. by 4 in. hinges and furnished with 4¾ in. "Niles" patent lock and bronze furniture, all complete. Vestibule door to be glazed in upper part and to have marginal ligbts filled with cathedral glass; furnished same as front doors. All doors, except closet doors, 1½ in., four paneled, white pine, hung on 3½ x 3½ in. regular loose pin butts, and furnished with the "Niles" patent mortise locks, brass bolts and strikes. All closet doors 1¼ in. thick, hung on 3½ x 3½ regular loose pin butts, and furnished with "Niles" patent locks. All inside doors, except sliding doors, are to have jet knobs and electro-bronze roses, No. 47 E; sliding doors are to be hung on Prescott's brace hangers, and furnished with flush locks.

Floors.—All on inside are to be covered with ⅞ in. x 4½ in. merchantable white pine flooring. Piazza floors 1¼ in. white pine, laid with white lead in grooves. Piazza is to he ceiled in good and workmanlike manner.

INSIDE TRIM.

All window casings and door trim, 5 in. Queen Anne, with turned corner blocks; all good white pine. All windows to have aprons and stools. Base on first floor 1 in. x 9 in., on second floor 6 in., all good white pine.

Shelve all closets, and furnish all on second floor with hooks.

Stairs.—Newel on first floor, 7 in., turned cherry. Rail, 3½ x 4 in., double Queen Anne; balusters, 1¾ in., turned cherry; risers, ⅞ in.; treads, 1¼ in.; strings, 1¼ in.; all white pine. Attic stairs inclosed, built in a strong and substantial manner.

Cellar stairs built of dressed plank.

Sink.—Put in the kitchen an 18 x 30 in. sink, with drip board, all complete. Connect it with a 1½ in. lead trap, back vented, and run waste to 2 inch cast water pipe, with fresh air vent and trap, before leaving the cellar.

Pump.—Furnish and set a No. 70 Douglas No. 2 pump, connect with 1¼ in suction to cistern, all complete.

Range and mantels will be furnished by the owner and set by the contractor.

Outhouse.—Build in usual manner.

PAINTING.

All metal to be painted two coats of metallic paint in linseed oil. All woodwork on outside painted two coats of white lead in linseed oil. Stain the inside and varnish two best coats of No. 2 varnish.

Finally, do all that is necessary to finish the entire house in a faithful and workmanlike manner, ready for immediate occupation.

NEW CREMATORY IN PARIS.

The municipal eouneil of Paris has, by a majority of votes, granted a permit for the construction of a crematory edifice in the famous cemetery of Pere la Chaise, and the plans of M. Formigé, the architect, have heen adopted.

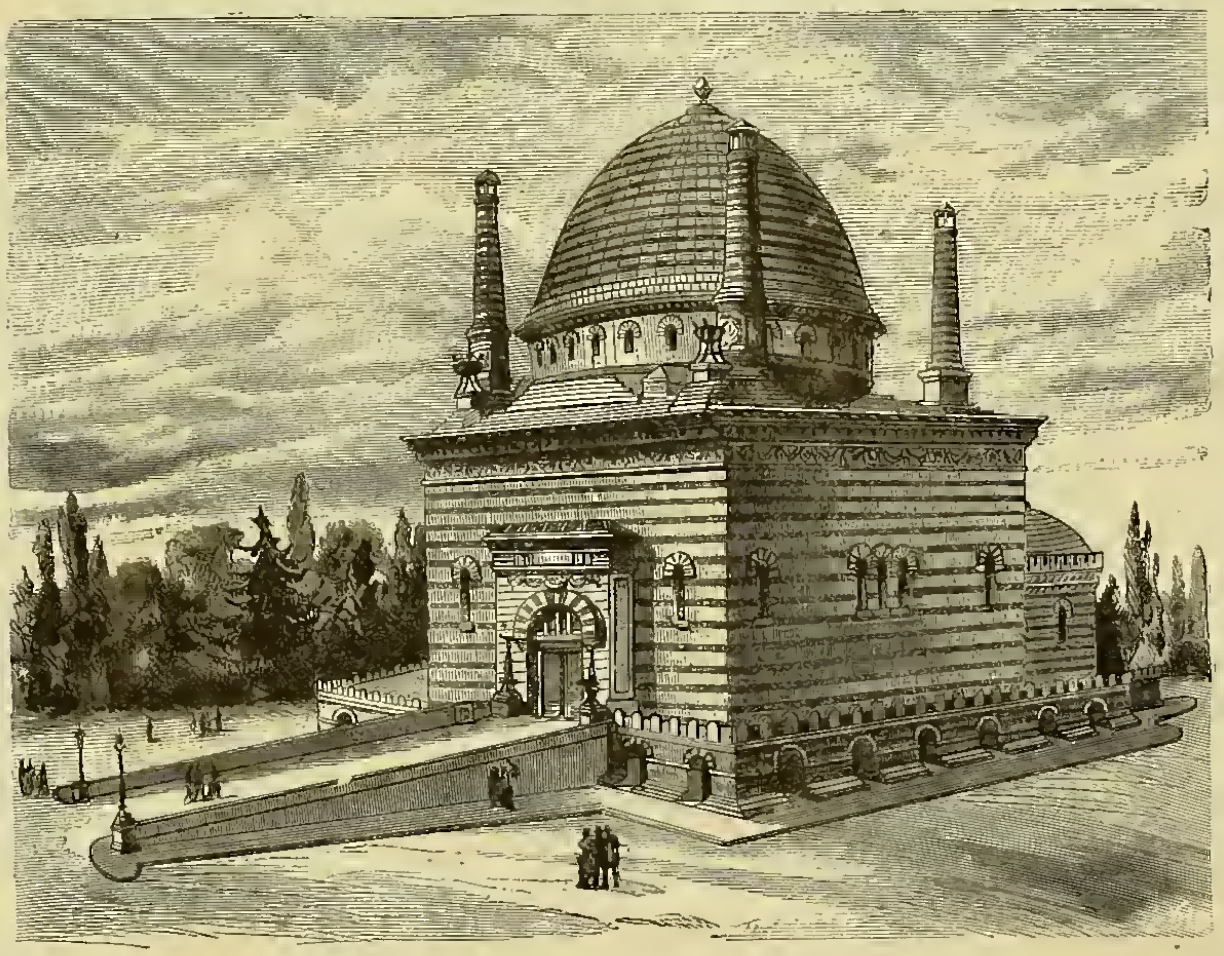
Our engraving shows an elevation of the edifice, which is located near the circular roadway of the cemetery, at one side of the street of Pyrenecs. The exterior of the huilding presents the appearance of a Byzantine temple, having correct and severe liues. The rear portion of the structure contains the furnaces for cremation, construeted and arranged in the most superior manner. The work is to be finished in June, 1887. This is to be an experimental edifice, privileged for two years, and will not he made permanent if, during this period, the Parisian public should becoine opposed to the burning of dead bodies.

The Catholic population do not favor cremation, however great its hygienic advantages may be, and although, as a Milan paper says, it hrings the consolation of knowing that purifying flames convert to ashes the remains of the dead.

Decorative Painting.*

Messrs. Winsor & Newton, of Rathbone Place, W., have brought out another handbook of their useful series on art, upon "Decorative Painting," the author of which is Mr. Owen W. Davis, architect, and a former contributor to this journal on subjects of the kind. Tbe work treats principally of the decorative painting of rooms, and describes various artistic materials used for decoration. As a guide to the amateur and student, Mr. Davis' little manual will he of service, if only in checking extremes or a taste for bizarre productions met with in this field of art. The several apartments of a dwelling house are taken in order. For the hall, the green and russet variety of hues are recommended for a country house. Pompeian red or hrown tints, with a self-color stencil for ahout two-thirds of the height from the skirting, not too declicate, finished above with distemper of rich cream color, is the treatment for the walls. The cornice may he in a stronger tone, picked out by color; the same breadth of coloring should be carried n p t h e staircase, though the decoration may be more pronounced. The author does not advocate the customary dado decoration following the handrail rake of stairs, for the reason—and it is a good one—that it reduces the apparent width and disturbs the perspective of the walls. The "endeavor should be to make the ascent appear as easy and inviting as possihle." This he proposes by carrying the borizontal lines through, and by introducing vertical forms or gradual, step-like decoration. The lower flight has the hlocking eourses carried through horizontally, with a star steneiled in alternate blocks. A decorative string terminates this blockwork on a level with the first floor landing, with a diaper filling above. A small vestihule or lobby opening on to a lobby may be treated in a rich decorative manner, and a Pompeian decoration is shown as suitable. For the stair soffit, a plain border with a simple diaper is effective, though folial designs in panels ean be arranged to have a pleasing character. Designs for morning room, dining room, drawing room, houdoir, and library decoration are suggested, with scales of coloring appropriate thereto. Speaking of the dining room, the author says it should neither be somber nor dull, but massive and dignified. If there are oil pictures, the dominant color of walls should be subservient to them, and used as their baekground. The tones advised are purpled red, chocolate, leather color, and dead leaf greens steneiled with a hrocade pattern in self-tint. Stamped leather paper is highly recommended for this room, which ean he hand-painted. Lincrusta-Walton makes a good dado, and the quieter it is the better, though a wood pancled dado two-thirds of height of wall is to he preferred. Referring to the tone of color of the drawing room, the author justly points out the value of attending to the aspect—a cold one demanding a warmer eolor than an aspect to the south or west. It is observed also that the hangings should determine the tone to he used as wall papers; and painting can be more readily obtained and made to harmonize with the curtains. A series of panels ahove the dado having the prevailing dado eolor, filled with designs of natural foliage on a plain or gold ground, with festoonings above this in the filling below the frieze, is suggested ; the prevailing hues of the walls to he a gray green, and the ground of frieze a vellum tint with ornaments in the neutral green, and wall ground color aided by positive color and gilding. A suggestion is given for a painted ceiling in the Italian style. For bedrooms quiet and tranquillizing effects are necessary, and the Adam and Louis Seize styles are appropriate for wall and ceiling decoration, the woodwork in all cases giving the key to the cornices and ceiling ; shades of green being useful. The scales of general tones given show the tints desirable in each case for framing, for wall filling. the mouldings, and ornament. The scales also suggests tints for the dado color, filling, frieze, and ceiling. The remarks on color are generally sensible, and the list of tints and pigments will he found of service. The observations on architectural features and on setting out the ornament are also useful, and Mr. Davis' book will be found a safe and artistic guide.—*Building News.*

* The Rudiments of Decorative Painting, etc. By Owen W. Davis, Architect. London : Winsor & Newton.



THE PERE LA CHAISE CREMATORY, PARIS.

A Note on Watering Potted Plants.

In the operation of watering potted plants, persons not practically familiar with plant culture are apt to make serious mistakes. Cultivators find by experience that an excess of water at the roots is very injurious to almost all plants, and hence it is usual to direct that great caution be used in the application of water, especially in winter. The result is that frequently the opposite extreme is fallen into, to the great injury of the plants. From the moment that the soil becomes so far dried that the fibers of the roots cannot absorb moisture from it, the supply of the plant's food is cut off, and it begins to suffer. Some plants can bear this loss of water with more impunity than others ; some again, and the heath family among the rest, are in this way soon destroyed. The object in watering should he to prevent this stage of dryness being reached, at least during the time a plant is growing, and at all times in the case of those of very rigid structure ; at the same time, that excess which would sodden the soil and gorge the plants is also avoided. Within these limits the most inexperienced persons may follow sound directions for the application of water with safety. But whenever water is given to pot plants, enough should be employed to wet the soil thoroughly, and the difference between plants that require less or more water should be made by watering more or less frequently, and not by giving greater or less quantities at one time.—*Farmer's (Irish) Gazette.*

To Imitate Ground Glass.

Put a piece of putty in muslin, twist the fabric tight, and tie it into the shape of a pad. Well clean the glass first, and then apply the putty by dabbing it equally all over the glass. The putty will exude sufficiently through the muslin to render the glass opaque. Let it dry hard and then varnish. If a pattern is required, cut it out on paper as a stencil plate, and fix it on the glass before applying the putty, then proceed as above and remove the stencil when the dabbing is completed. If there should be any objection to the appearance of clear spaces, cover them with slightly opaque varnish.

Composition for Making Artificial Marble.

In compounding this composition, which is the invention of Mr. Carl Straub, of Syracuse, N. Y., glue and water are mixed together under a moderate heat, so as to produce a thick fluid, to which is added a quantity of boiled linseed oil. After the oil has been thoroughly intermixed with the gluey fluid, either muriatic or sulphuric acid is added. This mixture is stirred for a short time, having been kept heated up to this point, and is then stirred till cool. After cooling it is allowed to stand for three days, during which time it is occasionally stirred. This solution may be kept almost any length of time ; and when it is desired to form any quantity of artificial marble, one part of the solution is mixed with twenty parts of water in which the mixture readily dissolves. Plaster of Paris is then sprinkled into the diluted solution, which is stirred while the plaster is being added. Enough plaster is added to form a dough as thick as moulding clay, and which should be thoroughly kneaded. After the dough is formed, it may be pressed into any shape or form desired, and may be colored by any of the well-known pigments.

This marble is particularly well adapted for ornamental work, as it is easily and quickly manipulated, and is capable of receiving a high polish. The dough, of course, can be pressed into ornamental shapes and forms as well as into plain, flat tablets.

Stained Glass Substitutes.

During the past few years the use of stained or "cathedral" glass, formed of small panes held in lead work, has considerably increased. The effect is excellent where a good design is chosen. The colored tints help to make a room cheerful, while, in both rooms or windows having a disagreeable outlook, in churches and in vestibule doors and transom lights, it is very effective. There is only one objection to the use of cathedral glass. It is very expensive, and especially where anything like an elaborate design is chosen.

Mr. W. C. Young, of 731 Arch Street, Philadelphia, Pa., is now manufacturing, under his patents, a substitute composed of thin, tough s h e e t s of linen, treated in such a way as to make an excellent imitation. The material is colored and is semi-transparent, and, being applied to the surface of the glass, it gives the effect of the opaque leads and richly colored stained glass in a very striking manner. It is quite durable, is easily applied, and may be had in a great variety of designs, of all sizes. Mr. Young publishes a fully illustrated and colored catalogue, and will send it free of cost on application.

Invisible Nails.

For attaching mouldings and other light lumber, a new kind of nail has been contrived, which leaves no nail holes. It is made with a point at each end, and with an outwardly projecting head or shoulder, midway between the points. The nail is first driven into the wood by means of a punch, which straddles the protruding point and bears on the head. When enough have been driven in, the moulding is placed over the nails and driven down.

Health in Schools.

In a voluminous report of Medical Inspector Taylor, presented to the board of health, the sanitary condition of the public schools of Philadelphia seems to show the presence of elements decidedly prejudicial to health. The chief fault appears to be in the dangerous proximity to the buildings of wells which are in a very foul condition. Nothing is more probably responsible for fevers and diphtheria than are these odor-giving and miasma-breeding pools, and the danger from them is heightened when so many children are gathered together in places which at best afford scanty air and poor ventilation.

A CITY RESIDENCE.

We give from the *Building Budget* a sketch of the residence of Mr. C. Thompson, from a pencil drawing by the architects, Messrs. Treat & Foltz, of Chicago. This is a substantial and attractive design.

Specifications for Plumbing, Gas, and Natural Gas Fitting.

BY L. O. DANSE, C.E., ARCHITECT, PITTSBURG, PA.

The following specifications are those prepared by me for two brick dwellings for Mrs. Bailey, to be erected on Murtland Avenue, East End, Pittsburg. For houses built to rent, I think the plumbing is extra good—better, in fact, than many persons put into their own houses; yet, had the houses been for personal occupation of owners, I should have insisted on using brass pipe for hot water instead of galvanized iron. The use of a terra cotta chimney top to hide vent pipes is original.

GENERAL CONDITIONS.

Contractor to supply all materials and labor requisite for the full and perfect completion of the entire work; to give it his personal supervision, keeping a competent foreman constantly on the ground, and to guarantee the work for one year from date of acceptance of same, making good any defects which may arise during that time from improper work or bad material. It is understood that this guarantee does not extend to such defects as may arise from causes beyon control of contractor during duration of said guarantee. He shall not retain on the work any man found incompetent or improper by the architect; and shall do his work in such a manner and at such times as not to retard the other mechanics on the buildings.

PLUMBING.

Tap main on Penn Avenue and lay in trench, four feet six inches below surface, a two inch cast iron service pipe, weighing not less than sixty-seven and one half pounds per length of seven feet, with carefully calked joints containing two and one-half pounds of lead each, with service cock and box at curb and at point where each branch leaves main line. Length of main supply pipe to be seven hundred and thirty feet.

Branch for each house to be one inch galvanized iron pipe with galvanized malleable fittings. To have stop and waste at point where it enters cellar, and run along partition wall of cellar at a uniform grade of one inch to one foot to point directly opposite the waterback connection in kitchen, where it shall have a one inch by three-fourth inch by one inch T, then rising to point four inches below ceiling of laundry, crossing to rise along flue and connect with waterback. Must be supported at least once in every length of the horizontal parts by wrought iron pipe hooks, firmly driven into walls and so arranged as not to interfere with expansion and contraction.

Run three-fourth inch XX strong lead pipe from T on service pipe, connecting to same with lever handle stop and waste, rough, along wall to supply wash trays, each of which shall have five-eighth inch compression wash-tray cocks.

Hot water supply to laundry to be three-fourth inch galvanized, with malleable galvanized fittings, and to come down from boiler along inner face of chimney jamb, then across ceiling at uniform grade of one-half inch per foot, down beside cold water riser and parallel to branch from same to tray. To have stop in kitchen.

Set thirty gallon Scarfe's patent dome head kitchen boiler on wall plate and supported by three-eighth inch iron rod with nut below plate and attached to joist above by screw eye of same size iron.

Set fifteen inch by twenty-three inch cast iron sink with hot and cold supply through three-eighth inch XX strong lead pipe, with five-eighth inch Dougherty self-closing bibbs; supply pipes to be carried on chimney jamb, and not on outside wall.

Supply to bath room through three-fourth inch XX strong lead pipes, carried along chimney breast and stair partition at a uniform grade of one-half inch per foot, with branch riser to W. B. of five-eighth inch XX strong lead pipe. Branch riser to W. C. tank to be one-half inch XX strong lead pipe, and supply to B. T. to be three-fourth inch XX strong.

Furnish and set six-foot (16 oz.) planished copper bath tub, with nickel plated double bath cock for three-fourth inch supply pipe, rubber plug, and chain, and four pound lead safe under all, with one-half inch drip pipe carried down to laundry and left exposed there.

Furnish and set Paragon "B" solid square top porcelain bowl and trap combined back outlet, washout W. C. with enameled double tank and seat action, cherry seat finished in light varnish without stain, with one and three-fourth inch heavy lead flushing pipe, as made by Standard Manufacturing Company.

Furnish and set style "A" 20 inch by 20 inch marble corner slab, with 13 in. porcelain basin, five-eighth inch self-closing Dougberty nickel plated basin cock and "Star" rubber plug, with chain and nickel plated chainstay.

Furnish and set wash pave in north wall of each building, with terra cotta drip stone and gutter tile, to discharge into branch of sewer. Supply to be through three-fourth inch galvanized pipe, and to draw from opening toward service pipe.

Trap each wash tray, sink, wash stand, and bath tub separately with one and one-fourth inch Sanitas trap to one and one-half inch (5 pound) lead waste pipes, calked into porcelain lined Y branches on soil pipe by means of brass ferrules wiped to pipe.

Soil pipe to be three inch porcelain lined "Standard" from outside of cellar wall, where it is to be carefully cemented into sewer, to be hereafter specified; to have three inch enameled running trap immediately inside wall, and three inch by three inch enameled T vent to it. Run three inch enameled vent pipe from T up and through wall below surface, menting same into three inch glazed earthenware pipe, laid with cemented joints, and bring to surface 18 feet from building with a cast iron grating at top.

Waste from wash trays to enter enameled T next to one for vent pipe.

Carry soil pipe along partition wall to within six inches of door opening, then rise and carry along the ceiling to foot of recess for riser. Provide one double Y branch, enameled, below ceiling of first story for waste from B. T. and W. B., and separate Y branch, enameled, for W. C. in thickness of floor, running soil pipe full size to top of chimney crock provided on ridge for that purpose. One-eighth bend will be required to turn pipe between rafters and another to turn up again at ridge.

Run two inch wrought iron vent pipe from bowl of W. C. parallel with soil pipe to roof. Make both tight to roof with sheet lead.

All joints of soil pipe to be made with melted lead, well calked, and hemp. No rags, paper, shavings, or putty to be used. Each section of vertical pipe to be supported by ears or bands, and all horizontal sections to be supported by wrought iron hooks and to have a uniform grade one-half inch per foot, with no pockets for retention of water.

Put up Standard "Acme" hopper water closet, number 311, as shown, in cellar, with round self-raising seat, enameled hopper on enameled one-half S trap, with one-half inch XX strong supply pipe, branching through partition wall from W. T. branch, and having stop and waste at lowest point so as to drain entire branch to main supply pipe. Trap of hopper to be calked into three inch enameled pipe reaching through wall and cemented into branch of glazed sewer. Tap trap for two inch gas pipe vent to run through wall and up same to roof.

All lead pipes used in this work to be supported by tacks soldered to pipes and screwed to boards to be provided by carpenter for that purpose. Tacks to be four feet apart on horizontal parts and six feet apart on vertical parts. Where the word horizontal is used, a grade of one-half inch to the foot is meant, unless otherwise specifically stated. All pipes to be kept in full view none being placed behind plaster or wainscot.

All connection between lead and galvanized pipe must be made by means of brass ferrules wiped to lead pipe and screwed into galvanized pipe.

Connection to soil pipe must be made with Raymond's combination ferrules.

When work is completed, the peppermint test must be satisfactorily made in the presence of the architect before same is accepted.

SEWER.

Lay six inch vitrified sewer pipe on grade of not less than one-half inch to the foot from well to Y where branches run to each building. Lay five inch branch to each building, with four inch branches to surface at each conductor shown on plans and at wash pave. Fit in separate four inch Y and branch, to each soil pipe. Cement all joints perfectly tight.

GAS FITTING.

A one and one-half inch wrought iron service pipe 730 feet long must be laid from main on Penn Avenue, with stop and Rickett's patent ventilated service box at curb, and additional stop and box for each house in same ditch with water.

All piping must conform to the rules of the company furnishing the gas.

No joist shall be cut more than eighteen inches from its bearings.

Ceiling lights to come fair in center of rooms. Brackets in halls five feet seven inches from floor, and in rooms five feet ten inches. All nipples to project one and one-fourth inch beyond finished surface of plaster and be capped until such time as fixtures are put on. Put meter on shelf in cellar, immediately under vestibule.

Run all pipes in such a manner as to all drain to a common point; having no pockets for accumulation of water, etc.

NATURAL GAS.

Service pipe two inches diameter, of wrought iron, with stop to each house and Rickett's patent ventilating service boxes, to be laid from Penn Avenue in same ditch with water service.

Regulator to be placed in areas as shown on front of houses.

Run one and one-half inch pipe from main service pipe to regulator, and one and one-half inch pipe from regulator through cellars, with one inch laterals to all flues colored blue on plans, and three-fourth inch risers in said flue. Take three-fourth inch branch from laterals through hearth to each fireplace in first story; and three-fourth inch branch for laundry stove down through flue to level of burner in stove.

Branches to fireplaces to come through walls of flues, stone hearths, and all visible pipes except those in cellar, laundry, and kitchen, shall be nickel plated and polished.

Nickel-plated screw valves with self-packing stems, of approved pattern, are the only form of stops permitted in this work.

Provide "Standard" burner for each fireplace, range, and laundry stove.

A CITY RESIDENCE.—TREAT & FOLTZ, ARCHITECTS, CHICAGO.

All fittings to he mallcable iron, galvanized, except those in finished rooms, which must be brass, polished and nickel-plated. All work to conform to regulations of fire marshal and board of underwriters.

A DWELLING AT SPRINGFIELD, MASS.

This cottage was recently erected in Springfield, Mass., and represents a house of modern design, conveniently arranged, and of moderate cost ($3 500), using best materials.

The hall is ample, with parlor, library, and dining room connected by sliding doors, with fireplaces in the adjacent corners of each room.

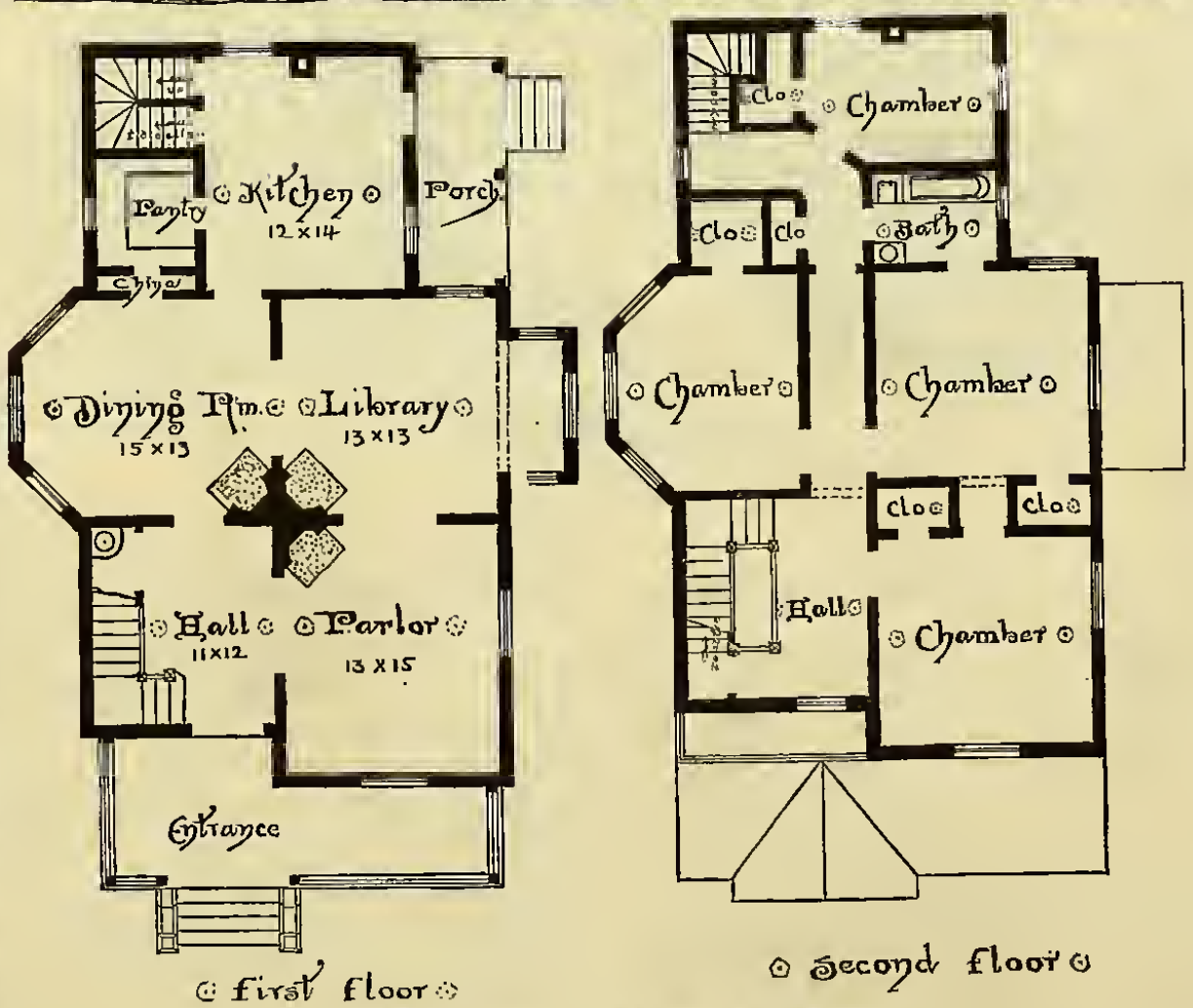
There are five chambers, with bath room and closets, on second floor, with two bed rooms and ample room for storage on attic floor.

The foundation is of brick, 13 in. thick up to grade line, and 9 in. thick above to sill. The cellar is 7 ft. high, with cement concrete for cellar bottom. Brownstone is used for window sills and hatchway steps.

The frame of the building is of spruce, covered with matched spruce boards laid diagonally (on this building they were laid to the northwest, as the prevailing winds are in that direction), overlaid with paper. The outside finish is of pine, with pine claphoards and bands of cut shingles. The roofs are of narrow matched pine boards overlaid with tarred paper, and covered with Chapman slate, 6×12, with lower edges cut.

The inside finish to be of ash, except kitchen, whicb will be of pine, grained in cherry. The doors are made of pine, with panels of ash to correspond with the inside finish of adjoining rooms. The upper floors of kitchen to be of black birch; remainder of house, pine floors.

Geo. H. Blanden,
Architect.
Springfield, Mass.



A DWELLING AT SPRINGFIELD, MASS.

Petroleum V. Nasby on Socialism.

I hate a capitalist, no matter how he becum one. I hate the meenspirited, grovelin retch wich will work ten or more hours a day, deprivin hisself uv beer, and terbacker, and cards, and bilyards, and bos racin, and sich, savin peny by peny til he hez ground enough out of the world to hev a shop uv his own, and to employ other men to slave fur him, and thus go on akumulatin til he owns things. Such men are monopolists, and the enemies of labor, and grinders.

I hold that the possession of a ten dolar bil makes a monopolist, and al sich shood be crushed. Ez hevin a ten dolar bil makes a man a monopolist, his monopolism increases jist in proporshen to the ten dolar bils he hez. The owner of a factory is a enemy to the buman race, and ez for the man who bilds a ralerode, he

> "Is a monster uv such hidgus meen,
> That to be hated needs but to be seen."

My hatred of railroad managers is intens. It comuenst with the first tiue I wuz drop off the hind platforn uv a trane for not payin fare, and hez increst with every repetishun uv the ofense, which generally happens every time I want to go anywbere. I lothe the ralerode monopolist.

A grindin monopolist is any man wich has anything. Whenever a man hez saved anything, he becomes a capitalist, and ez capitalists are dangerous to labor, he should be made to divide it up, so ez to be on a ekality with them wich never saved nothing.

The mechanic or workingman wich saves so ez to own a house or a farm becomes a capitalist, and consekently a grindin monopolist, and ez accumolashens are dangerous to labor, wat he hez shud be confiskated and divided up among us wich hezn't anything. Property is a criue.

I ain't jist shoor that I hev got the socialistic doctrine down fine enuff, but I think these definishuns will do, espeshly when you howl em under a red flag to luvers uv humanity wich is chuck full of stale beer.

Brickmaking Under New Conditions.

A few years ago the making of bricks was deemed to be all but impracticable at any site which did not itself contain the raw materials required for the manufacture. Now, however, Taylor & Neate, Medway Works, Rochester, have introduced slurry pumps, by the use of which the brick manufacturer is enabled to prepare his earth upon the site whence he draws his supply, and convey it thence in a liquid state through iron mains to the brickfield, where it is intended to be converted into bricks. In this way Smeed, Dean & Co., Sittinghourne, bave lately obtained an enormous supply of fresh brick earth from a property about a quarter of a mile east of Tonge Church, and nearly two miles distant from their present brickfields. The most important feature of the undertaking is the set of pumps for pumping the washed brick earth through a cast iron pipe main to the brickfields, which are the largest and strongest pumps that have ever been made in the district for brickfield purposes.

House to House Inspection.

The Illinois State board of health has received the report of the house to house inspection made by the board of health of the city of Springfield. This is by far the most complete and thorough inspection that bas been made by any town or city in the State, and reflects great credit upon the city and the superintendent, Dr. B. Barret Griffith. There were found to be in the city 4,738 houses; the sites of 4,094 were good, 437 fair, and 207 bad; only 453 are sewered. Of these, 7,329 are built of wood, 1,009 of brick, and 19 of other materials. The basements or cellars of 2,188 were dry and 724 damp, while the ventilation of 2,329 was good, 271 fair, and 252 bad, and the general condition of 2,350 was good, 248 fair, and 194 bad. There were found 1,747 cesspools, sinks, and drains in good condition, 150 fair, and 90 bad, 1,505 of these connecting with sewers; 3,075 privies were found in good condition, 434 fair, and 582 bad, 96 of them baving connection with sewers. Out of 466 water closets, 427 were found in good condition, 20 fair, and 19 bad; 444 have connections with sewers. The yards of 3,879 were in good condition, 316 fair, and 261 bad.

Of the hydrants, 475 were found in good condition, 337 fair, and 1 bad; 3,085 cisterns were in good condition, 39 fair, and 48 bad, while 3,577 wells were in good condition, 225 fair, and 115 bad. Of these latter, the water in a number was examined and found to be unfit for use, and they were accordingly condemned, owing to their contamination from surface drainage and privies. This was one of the most important facts elicited in the investigation, and sbows the great necessity of preserving wells from pollution, especially where the general water supply is not what it should be, owing to local causes.

During the time of inspection there were found 152 cases of sickness, showing the general health of the city to have been very good. Some of these cases were attributable directly to the water supply.

The vaccinal status was found to be as follows:

Adults vaccinated	15,637
Adults not vaccinated	1,353
Adults revaccinated	9,184
Children vaccinated	6,866
Children not vaccinated	3,041

There were found 3,716 nuisances and defective conditions affecting life. Nearly all have been abated or removed. Maps of the water supply and sewerage accompany the report. All this has been accomplished at the trifling cost of $947.50.

The Tehuantepec Ship Railway.

E. L. Corthell, chief engineer of the Tehuantepec Ship Railway, delivered, on December 20, before the New York Academy of Sciences, in the Hall of Columbia College Law School, an address on the Isthmian Railway. Mr. Corthell having gone through an exhaustive account of the historical precedents of ship transportation in the past 2,400 years and having by statistics shown that the proposed Tehuantepec route was the most feasible for the purpose, gave an account of the mechanical devices and plans, their cost and advantages. He brought numerous statistics to bear to show the economy of the scheme on account of the traffic which, because of the abolition of an ocean voyage of 11,000 miles, would pass over it.

This traffic he estimated at almost 6,000,000 tons. He then descanted on the general benefit to mankind resulting from its enabling civilization to advance with more rapid strides. He expressed confidence in its ultimate success, and declared that Suez furnished a precedent as to the country into whose hands this grand achievement will eventually fall, should the United States take no decided national interest in it.

"This work when finished," he concluded, "will be the realization of the ardent wish of statesmen and philanthropists everywhere, the dream of kings and conquerors during the last 350 years, and a fitting supplement to the grand achievements which have marked the progress of the nineteenth century."

A COTTAGE AT HALIFAX, N. S.

We give a sketch of a suburban cottage designed by C. H. McClare, architect, Cambridge, Mass., for a gentleman at Halifax, N. S. The building is of wood, the outer walls and roof to be covered with sawn shingles, stained a warm color before laying, the roof to be darker than the walls, and the finish and copings a lighter color.

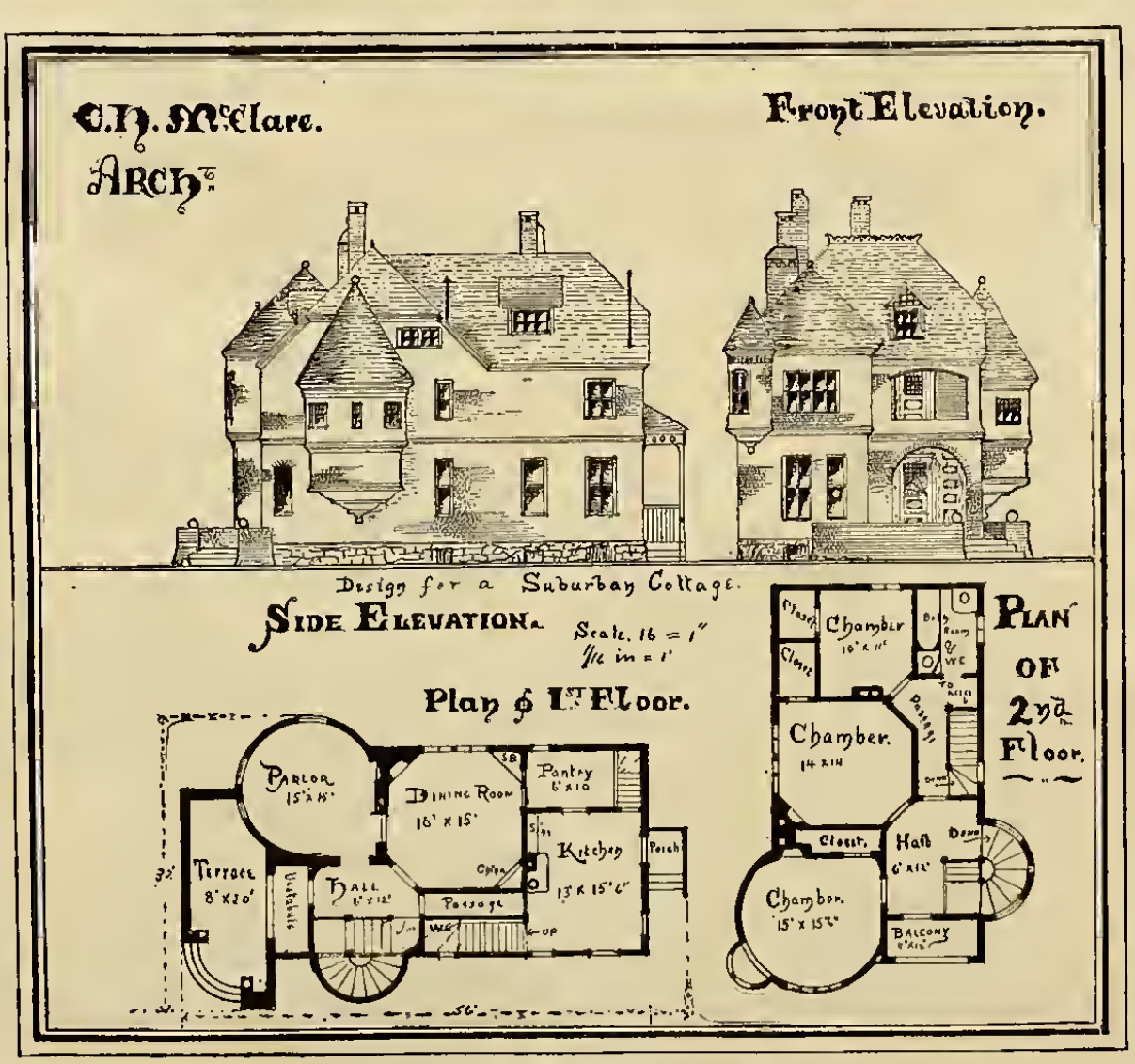
The rooms all of good size and convenient, as the plans show, with three on each floor, with closets, halls, etc.

The first story will be 9 ft. 3 in. between floor and ceiling, the second floor will be 8 ft. 3 in., and the attic will be 7 ft. 6 in., and will be finished in pine, painted. It will contain two bed rooms and a store or lumber room, with closets. The second story will be finished in whitewood, stained cherry, and have open grates for soft coal; the bath room and water closet is on this floor. The parlor will be finished in cherry, including mantel for open fireplace. The dining room and hall is to be finished in English oak, which includes a large mantel and sideboard in the dining room.

The vestibule to be finished in oak, paneled as shown in the sketch.

The kitchen and pantry to be finished in pine, natural or an oil finish. A set range, with hot water tank, is in the kitchen, also stairs to cellar and next floor. The cellar to be concreted and contain a furnace and laundry.

The cost to complete it is estimated at three thousand dollars in that locality.



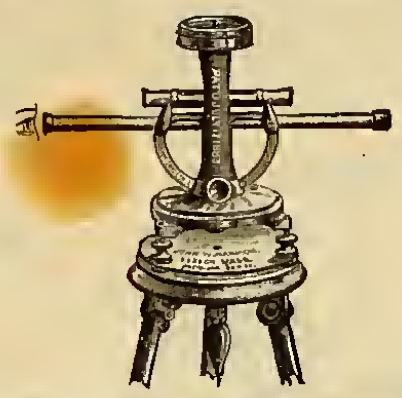
A COTTAGE AT HALIFAX, N. S.

Concrete Floor.

If the wet state of the concrete floor does not arise from land springs or some other source beneath, then it can only be from condensation. The impervious character of good concrete and Portland cement, and the comparative coldness of the surface, are sure to cause—if there is no artificial heat in the room—that appearance of an irruption of water which many persons cannot believe arises simply from the condensation of moisture with which the atmosphere is heavily charged in damp and changeable weather. The only remedy is to cover the floor with a carpet, matting, or some material of a higher temperature than the floor; but of course this does not dispel the watery particles held in suspension. Obviously, such a floor is not healthy, for it does not hold or retain moisture but for a short time. This applies to concrete walls as well as floors, and is direct evidence that the atmosphere is at the time too damp for the room to be occupied without some form of artificial heat being introduced to make the air drier, and a single lamp will often effect this and prevent all appearance of moisture. I have known a doctor report a concrete cottage as being unfit for habitation, as moisture runs down the walls; but a candle burning through the night having to all appearance prevented it, he acknowledged he was mistaken.—*Thomas Potter, Building News.*

A NEW LEVELING INSTRUMENT.

The advantages of an accurate and easily adjustable leveling instrument in setting out buildings on the ground is well understood by builders and contractors. The time saved is considerable, and the exactness which is so necessary in this description of work is, to a great extent, insured. The instruments hitherto manufactured have been, as a rule, so expensive as to preclude their general use, excepting in the more extensive works.



HARMON'S NEW LEVELING INSTRUMENT.

Mr. John W. Harmon, of 65 Haverhill Street, Boston, Mass., is the manufacturer of an improved level of considerable completeness and utility. Its general form is shown in the engraving. The simplicity of construction enables the manufacturer to sell at a very moderate price, while the whole arrangement of parts is specially designed to insure accuracy and speedy adjustment.

The special points of construction are protected by patents, and consist of the central stand, provided with a circular gauged flange and a centralizing pointer, with the adjustable screws.

The instruments are supplied either with or without the magnetic compass, and may be used either as a level or theodolite for the various purposes of architects, builders, contractors, engineers, and others. It is claimed that they will do all that is required of the more expensive instruments, excepting where the distances are of very long range.

In the manufacture of a pair of ordinary window sashes, it is necessary to make twenty-four mortises; and in a common door or pair of blinds, from twelve to sixteen mortises.

Air in Greenhouses.

The circulation of air is one of the most important provisions in all kinds of horticultural buildings. Nothing but that will fairly exclude damp, or in any damp weather counteract its effects. It is not enough to open every front window. It would be far better to open only one and let down a top light a little. In all cases there should be an outlet as well as an inlet, and for want of this many houses do not answer well for plants. A circulation of air causes a more rapid evaporation, and it is a common thing among good gardeners to open a lower window even in wet, cloudy weather. Let down one of the top lights a little, and light a fire. By this a free circulation is created and the house dried, although it were in the midst of rains and cloudy weather. It is too common a thing to see the top lights let down to give air to a house, and no other part opened. This is all wrong; for there should be a draught. On the other hand, we see all the front windows and no top lights down. Many persons build pits three or four feet high at the back and half the height in front, and no air but what can be obtained at the top. We would always provide air holes at the bottom, as without such there can be no draught, no free circulation. When pits are built without this provision, the best mode of giving air is to pull up one light to let in air at the foot of it, and push down the next to open at top, and so on alternately through the whole range of lights, however long the pit may be. It is the same in giving air to a hotbed, only that when the air is rarefied, as it is inside, tilting the light a little lets out the steam, and the cool air will get in somewhere; but sometimes when a frame is made too close and the glass is puttied at the joints, things fog off in spite of tilting, because there is no circulation.

Advantages of Low Ceilings.

Rooms with low ceilings, or with ceilings even with the window top, says the *Popular Science Monthly*, are more readily and completely ventilated than those with high ceilings. The leakage of air which is always going on keeps all parts of the air in motion in such rooms; whereas, if the ceiling is higher, only the lower part of the air is moved, and an inverted lake of foul and hot air is left floating in the space above the window tops. To have the currents of fresh air circulating only in the lower parts of the room, while the upper portion of the air is left unaffected, is really the worst way of ventilating; for the stagnant atmospheric lake under the ceiling—although motionless—keeps actively at work under the law of diffusion of gases, fouling the fresh currents circulating beneath it. With low ceiling and high windows no such accumulation of air is possible, for the whole height of the room is swept by the current, as the dust of the floor is swept with a broom. Low ceilings have also the advantage of enabling the room to be warmed with less expenditure of heat and less cost of fuel. The above does not agree with the generally accepted idea of the height of rooms in dwellings, but the authority is good, and well worthy of consideration by persons about to build.

Distempering Ceilings.

Give the ceilings a coat composed of soft soap, lime, putty, and size. The quantities to be used of each ingredient entirely depend on the finish of the ceiling; some are much more absorbent than others. The soft soap prevents the dry plaster absorbing the color too quickly, so that a clean, even surface may be obtained with the finishing coat. If the workman is not a practiced hand, he may be successful in laying an even coat of distemper; and even if he should succeed, if his ceiling is gray finished, the sand will probably spoil the distemper.

FURNITURE POLISH.—Equal parts sweet oil and vinegar and a pint of gum arabic, well powdered; shake the bottle and apply with a rag. It will make the furniture look as good as new.

A $2,200 RESIDENCE AT DETROIT, MICH.

We give a sketch of a frame house now being built on Perry St., Detroit, Mich., for Mr. M. McNamara, from plans made by A. C. Varney, architect, Detroit. The cost will be about $2,200. The house consists, on first floor, of hall, parlor, back parlor, dining room and kitchen, and one large chamber; and, on second floor, four neat chambers and bath room. It has a good cellar under the dining room. The remainder of house rests on brick piers. It is finished inside with pine and hard oil finish.

Removal of Snow from Streets.

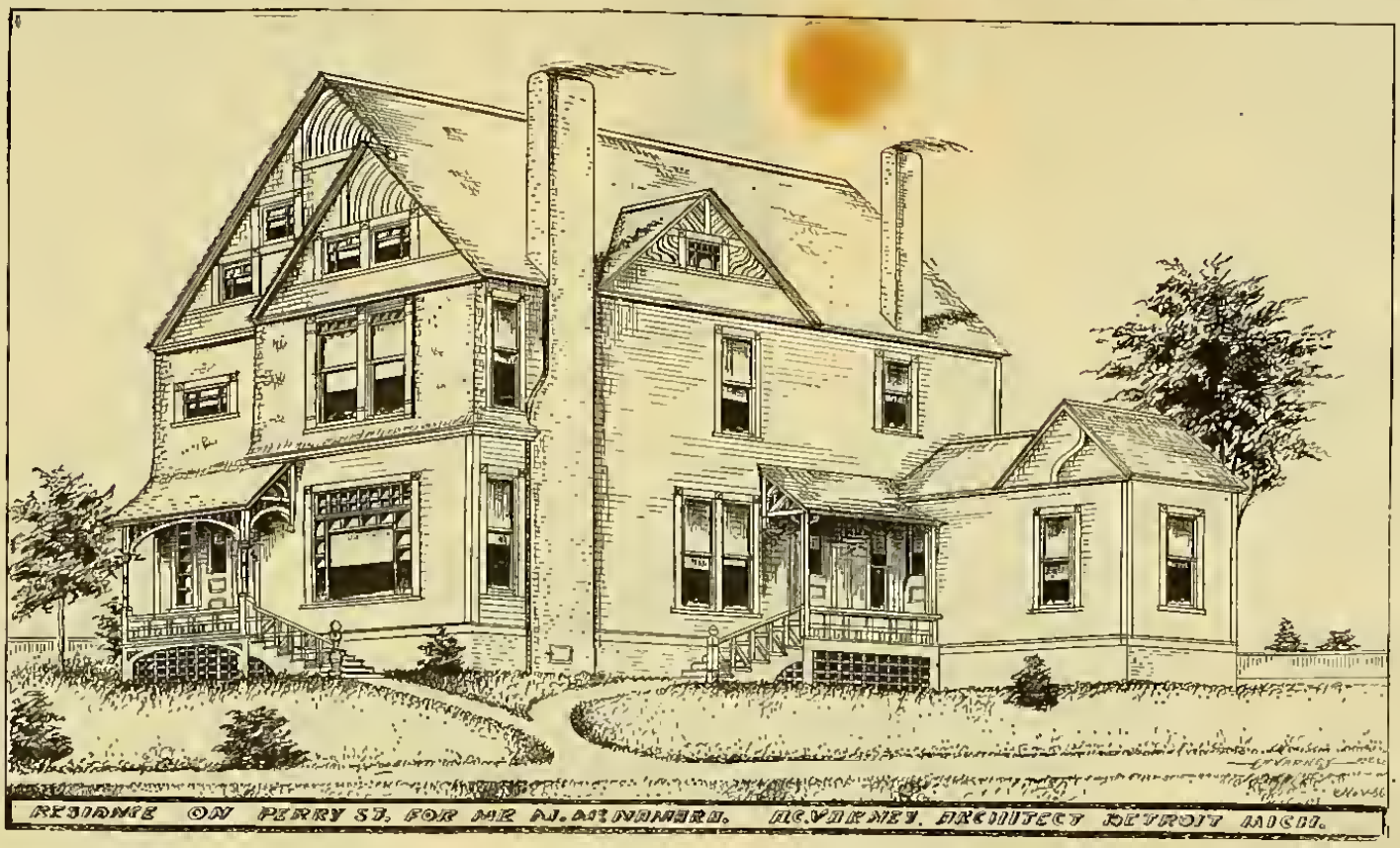
The difficulty of cleaning the streets not only is perennial, but it is one that becomes more disagreeable, and yet more imperative, with the increase of traffic and the growth of population. The streets of New York are frequently choked by the throngs of vehicles even in the best of weather, and of course a heavy fall of snow makes matters worse. In addition to the trouble thus caused, the accumulations of snow are sources of annoyance to pedestrians, and the filth collected in the slushy mass is a serious danger to health.

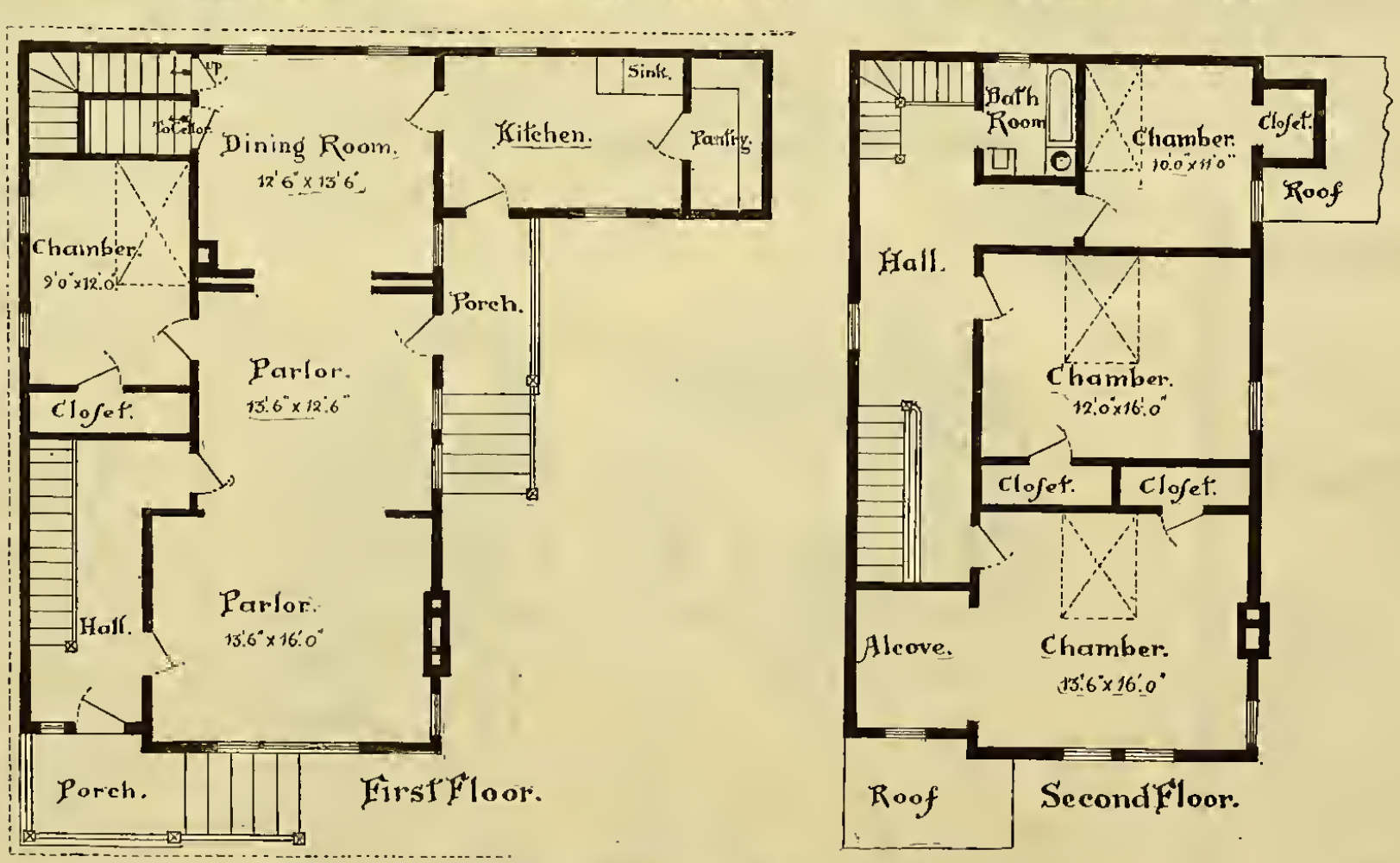
The expense of carting away the snow has been variously estimated to range from seventy-five cents to one dollar per cartload; but even at fifty cents per cartload it is manifest that to properly clear the streets would cost enormously. Take, for example, one street block 200 feet long and say 50 feet wide, having a surface area of 10,000 square feet. A moderate snowfall of three inches of snow will give 2,500 cubic feet on that one block of street. Assuming that in loading this is packed down to nearly half—say 1,350 cubic feet—there would be 50 cubic yards of snow to be carted; and allowing two cubic yards as the outside limit of each load, there would be 25 cartloads to be taken from each block, at a minimum cost of $12.50, or $250 per mile, for every snow storm.

The use of steam has often been suggested, and we have described in our columns various forms of steam apparatus, but they have generally failed to give satisfaction, in part because they are not sufficiently expeditious, and in part because they were too expensive. In New York, Lockport, and other cities where steam distributing companies have laid mains, attempts have been made to melt off the snow by turning upon it live steam. This plan melts the snow very fast, but in nearly every experiment there has been an enormous loss of free steam in proportion to the work done.

Recently, Mr. Charles E. Emery, C.E., Chief Engineer of the N. Y. Steam Company, has employed a novel apparatus with such success that it bids fair to solve the problem. While it is probable that it can be operated more expeditiously and economically by using steam taken from underground supply pipes, its use is not limited to this supply. Any locomotive or movable boiler could be employed. All that is needed is to keep the steam in contact with the snow without letting a great portion of it escape before touching the snow. For this purpose a broad, light, rough, and strong sled, with openwork runners, is fitted with a short pipe passing through the top of the sled, having a hose coupling at its upper end. A tarpaulin, or canvas spread, about 25 feet square, made steam tight, extends from the sled as a center, and the hose coupling passes through it. The tarpaulin is piled on the sled until it is drawn to the place for beginning work; the tarpaulin is then spread out upon the snow to its fullest spread, the edges are tucked into the snow, connection is made by hose from a boiler or steam pipe to the sled, and the steam is turned on, a pressure of 40 pounds being sufficient. The steam cannot escape into the air, but is held right down to the work required of it; and in a very few minutes the deepest snowbank or the iciest packed roadbed yields to the heat and runs off as water. By repeating this operation a street can be cleaned in a very moderate length of time and at small expense. The three inches of snow on 10,000 square feet of street on a block, if removed by carts, would be, say, $12.50. The melting process would require that the tarpaulin should be shifted sixteen times to cover the street 200 feet long and 50 feet wide. Making the excessive allowance of 15 minutes for each shifting of the tarpaulin, the street would be melted off in four hours. The cost would depend upon the amount of steam used. That is a difficult matter to calculate, for it would vary according to the temperature of the air and of the snow. The N. Y. Steam Co. charges $1 for 2,000 pounds of steam, which would melt from six to seven tons of snow, and on that basis the steam would cost from three to four dollars per block, and the labor of attendants, etc., probably as much more, say $8 per block, or $160 per mile.

To carry out such an undertaking, even where there are steam mains already laid, would call for a considerable outlay. Steam plugs, like fire hydrants, would be needed on every corner, and each melting would require about 100 to 125 feet of steam hose, capable of sustaining a pressure of certainly over 40 pounds to the square inch, and preferably 80. It is probable that a private company could be organized to do this work. The plan has been successfully operated, and it seems to present a practicable and economical escape from the present disagreeable and dangerous condition of our streets during the winter months.





A $2,200 RESIDENCE AT DETROIT, MICH.

How to Grow Large Potatoes.

A superb lot of potatoes which was lately exhibited at a French exposition, and considered worth a gold medal, attracted a great deal of attention. The cultivator gave the following as his method of increasing the size of the tuber: When the young stems have attained about four inches in height, all of them excepting two of the central ones are cut away, and these two only allowed to grow. By means of this simple precaution the tubers become much larger than they are in ordinary cultivation.—*Vick's Magazine for December.*

THE GRECIAN ARCHITECTURAL STYLE.*

BY PROF. N. CLIFFORD RICKER.

1. *Building Materials.*—Stone was most commonly employed in Grecian buildings, since it was found everywhere, and it was almost invariably carefully cut and laid dry, without mortar, but with very fine and close joints, sometimes hardly visible. But these joints were good for but a few inches from the exterior, the internal surface of the stone being roughly undercut to save time, though this sometimes caused the joints to flush. The masonry is sometimes very strongly bonded by interlocking the stones, greatly increasing the cost, though the bonding is frequently neglected, and metallic cramps were used in the more important buildings.

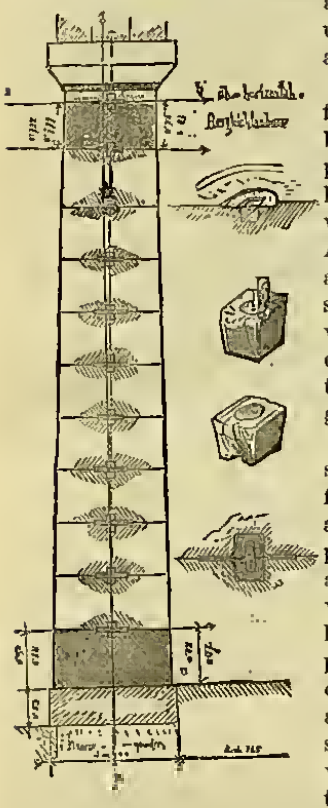


Fig. 1.

Marble was always preferred, when its cost could be met, especially for temples, the favorite variety being the Pentelican, which was quarried near Athens. The Parthenon at Athens was entirely constructed of this marble, which contains a small quantity of iron, causing the surface to take a rich golden tint by exposure.

Limestone was used as a substitute for marble and for ordinary purposes, and as it does not take a good polish, its surface was usually coated with a fine white stucco, very smoothly polished, to give the appearance of marble. This coating was very durable, as it is still found in a good state of preservation, but was rarely of uniform thickness, the surface of the stone being cut with less care than if visible.

Trachyte of a very dark color was used for the Temple at Assos, in Asia Minor, otherwise notable for its unique sculptured architrave.

Pavements, foundations, walls, columns, and cornices, with the occasional exception of the corona, together with the ceilings of the porticoes, were always constructed of stone.

Terra cotta was sometimes employed for decorative purposes, such as the corona or crown moulding of the cornice, a gable rosette, antefixæ, etc., as well as for the tiles of the roof, which were rarely of marble. This material was frequently moulded and also decorated by geometrical or other forms, painted in red and black.

Bricks appear to have never been used by the Greeks.

Wood seems to have always been far from abundant in Greece, and was only used for rafters, and for paneled ceilings having spans too great for construction in stone. Paneled construction appears to have been common in ceilings, the panels being either of wood or terra cotta, decorated by sculptured mouldings, gilding, and painting. In some very ancient temples, rough trunks of trees were employed as columns.

Iron and bronze cramps, set with lead, were used for more strongly binding together the stones in the walls of the most important buildings, as in the Parthenon. Bronze furniture seems to have been common in the temples.

Gold and silver were only used for decorative purposes, though golden shields were sometimes suspended on the architrave of a temple as a votive offering.

Metals were still much too rare and costly to be employed, excepting for decorative or for the most essential constructive purposes.

2. *Method of Construction.*—The general system which forms the basis of Grecian architecture is that of post-and-lintel construction, similar to that of the Egyptian temple, but substituting the gable for the flat roof, on account of the greater rainfall. The site of the building was cleared off, leveled, and a solid platform of stone then constructed, slightly larger than the intended structure, with a series of steps extending entirely around it. This was usually covered by large and carefully joined slabs of stone, which formed the floor. On these, the outlines of the plan were marked, and the walls and columns then erected.

The columns were built of drums or short cylinders, closely jointed by grinding with sand, and the external surface was usually cut after being set up, though the upper and lower drums were first finished, to serve as guides for the remainder. These columns supported the architraves, usually composed of three slabs set edgewise, and the cornice, as well as the ends of the rafters (Fig. 1).

The roof was formed of wooden rafters, which supported the edges of the covering tiles, usually of two forms, with ornamental decorations at the ridge and eaves.

Greek construction was excellent, so far as it was intended to be visible; but when concealed, the workmen were often careless, and many faults were permitted which would not be allowed in a modern building under the superintendence of a careful architect. Mortar and concrete were not used.

The Greeks were probably acquainted with the arch, and perhaps also with the vault and dome, but never employed them, preferring the post-and-lintel system, leaving the arched system to be developed by the Romans.*

3. *Curvature of Horizontal Lines.*—By some writers, Penrose and Pennethorne, for example, it is asserted that the top of the stylobate and the lower edge of the architrave, as well as the horizontal lines of the cornices, were all slightly higher at the middle than at the ends of the building, thus making these lines curves of very slight curvature, instead of being straight. The reason assigned for this was that the apparent dimensions of the building would thereby be somewhat increased, especially if the observer were placed opposite the center of one side, and that this would also correct any tendency of a straight line to appear depressed at its center. It is evident that this would materially increase the cost of the building and the care and labor required in its erection. The triglyphs and metopes would not be truly rectangular, but slightly trapezoidal.

It is found that the centers of the sides of the stylobate of the temple of Theseus at Athens are now from one and five-eighths to two inches higher than the angles, these sides being 104 and 45 feet long. But the angles of this stylobate are not all in a common plane, and there are also many other slight inaccuracies in construction, so that after a careful examination and measurement of the building in 1879, Professor Durm decided that there was no ground for the curvilinear theory, and that the differences observed were due to carelessness in the erection of the building, to unequal settlements, or to injuries during the centuries which have elapsed since its completion.

4. *Polychromy.*—Previous to the publication of Hittorf's work, in 1851, it had been assumed that Grecian temples, being either constructed of white marble or coated with white stucco, were not externally decorated by color. But a close examination of the examples still remaining showed that a large part of the exterior was actually painted with bright and full colors. Also, that some portions of the statues and reliefs were colored, though it appears probable that these were only partially colored, the drapery and the background being painted to accent the outlines of the figures and afford a stronger contrast.

Full and pure colors were employed by the Greeks, such as blue, red, green, yellow and gold, with brown and black for pottery, and pink, light green, and violet for the draperies of statues. These were sometimes opaque, sometimes applied as transparent glasses, and were frequently encaustic, or prepared with wax as a vehicle.

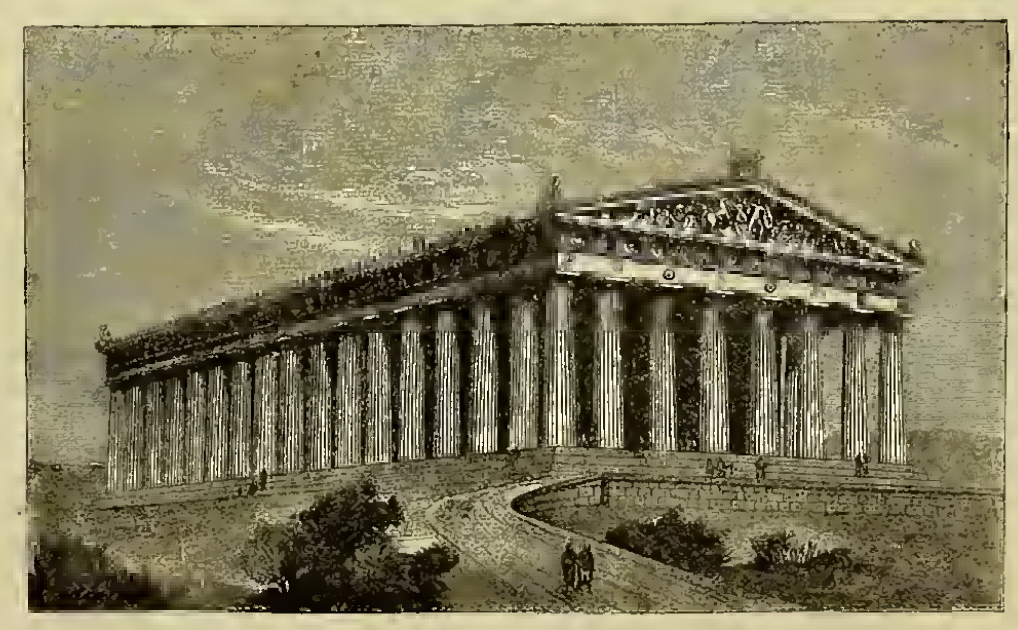


Fig. 4.—THE PARTHENON.

The walls of the cell of the temple, the columns, the architrave and cornice, were either unpainted or were of a clear orange yellow tint. The abacus of the capital was red, decorated by a gilt hand of fret ornament. The echinus was dark green, its leaves outlined with red and gold, with deep red annulets. The under surface of the architrave was ornamented by guilloches; its outer surface by inscriptions in gold and metallic shields or scroll ornaments. The guttæ were gilded. The triglyphs were blue with gilt ornaments, and the ground of the metopes was a deep brown, while the reliefs were sometimes fully and sometimes partially painted in their natural colors. The bed mouldings were gold or green and red. The ground of the lower surface of the geison was vermilion, with mutules of blue and gold ornaments. The vertical surface of the geison was ornamented by leaf

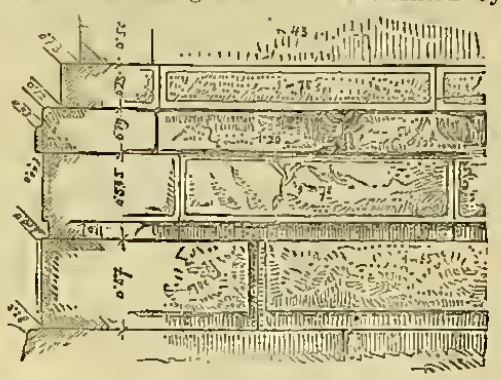


Fig. 2.

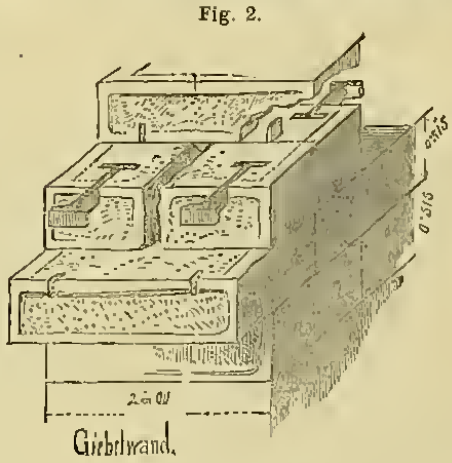


Fig. 3.

ornaments in green and red, and a gilt honeysuckle ornament decorated the corona. The ground of the tympanum was brown, with statues sometimes of the natural colors. This applies to the Doric order.

The exteriors of Ionic and Corinthian buildings were similarly decorated, excepting that a large proportion of the decorations were sculptured instead of being merely painted. Volutes were red, with yellow hollows and gilded eyes. The ground of the inner frieze was usually blue, with reliefs in natural colors, like those of the exterior.

Hittorf published a colored restoration of a Grecian temple, and an imperfect attempt was made to employ this arrangement of colors in the entrance hall of the United States Patent Office, but the colors and their arrangement are not approved by modern artists and connoisseurs, and it has seldom been employed. Either our preference for mixed, broken, and more quiet coloring is erroneous, the result of inferior taste, or the Greeks never succeeded in the use of color so well as in that of form. It is possible that Grecian temples were not painted when originally built; that this was done under the Roman Empire, or later.

5. *Walls.*—These were always built of large blocks of stone with dressed beds and joints, the face being sometimes left rough in terrace walls (Fig. 2), sometimes having draughted margins, but always smoothly cut in important buildings. Great care was taken to obtain fine and close joints, mortar never being used, nor was the interior of the wall ever composed of a concrete of stone spalls and mortar, as in modern building. Cyclopean masonry was rarely used, and notched stones are not common, the rectangular ashlar being most frequently employed. The wall was two-faced, the courses of the sides not always corresponding, and often merely resting against each other or connected by metallic cramps, though through bond stones are sometimes found (Fig. 3). No separate and proper foundation was provided, but the wall stood on the stone pavement of the building. The thickness of the walls of Doric buildings was about one-tenth their height, and usually diminished from bottom to top, the external surface therefore being slightly inclined inward. This batter amounts to $4\frac{5}{8}$ inches for a height of thirty feet in the walls of the Parthenon. This was probably done to better accord with the columns, which were always considerably diminished, their axes also being sometimes inclined inward. Walls of buildings in which the Ionic order was used were never battered,

* The figures are taken from Durm's "Griechische Baustyle;" Lubke's "History of Architecture," Vol. I., sixth edition; and Mauch's "Architektonische Ordnungen."—*Building.*

and were thinner, their thickness being about one-twelfth their height.

6. *Roofs.*—The roofs of Grecian buildings were never flat, nor were they ever ornamented by proper windows, forming a prominent architectural feature of the building, though simple openings for the admission of light probably frequently existed in some form. They were decorated by acroteria, placed at the apex and ends of each pediment (Fig. 4).

The term pediment is applied to the horizontal and the two inclined cornices at the end of a Grecian building, together with the triangular wall surface included between them, which is called the tympanum.

The principal forms of Grecian roofs were the following:

A. The gable or pediment roof, always used for temples, and composed of two plane surfaces. This was constructed of wooden rafters, spaced to support the edges of tiles of terra cotta or, rarely, of marble. No trusses were used. The tiles were of several kinds, but generally consisted of broad tiles with their edges turned up, which were covered by overlapping narrow tiles. Ornamental palm leaf forms, called antefixæ, were added to these covering tiles at the eaves and the ridge of the roof. There was no gutter to receive the water, which dripped from the edge of the roof (Fig. 5).

B. The pyramidal terraced roof, as in the tomb of Mausolus, constructed of stone steps, with a quadriga at top.

C. The conical roof was employed for circular buildings, which are very rare in Greece, and was constructed like the gable roof, though trapezoidal tiles were required.

D. The conical stone roof of the Monument of Lysicrates was unique, consisting of a single large slab of stone, hollowed out beneath the upper surface, being decorated by scale-like forms, perhaps suggested by pine cones. A central ornament supported a bronze tripod.

7. *Mouldings.*—These afford some of the most striking and valuable characteristics of the style, since the Greeks appear to have first appreciated the beauty and effect of mouldings, singly and in combination with other architectural details.

The *profile* of a moulding is the outline of its cross section. A moulding may be generated by moving its profile in either of two ways:

1st. Along a straight line, producing *rectilinear* mouldings.

2d. Along a circle, or by rotation about an axis, producing *annular* mouldings, used only for capitals and bases of columns.

Grecian mouldings possess some very distinctive characteristics, thus serving to readily distinguish the style from all others:

A. Some unique forms of mouldings are employed, as the hawksbill, etc.

B. Profiles of mouldings are rarely circular arcs, but are usually portions of ellipses, hyperbolas, parabolas, etc. (Such profiles are employed in no other style, excepting imitative Grecian.)

C. The outlines of the ornaments painted or sculptured on the surface of the moulding are generally similar to the profile of the same moulding. It is usually the case that only the surfaces of alternate mouldings are thus decorated, the others being left plain, with the exception of the astragal, which is almost always ornamented.

D. The mouldings of the caps and bases of antæ or pilasters are almost invariably very different from those of circular columns, in profile, arrangement, and decoration. (In Roman and later styles these are generally similar.)

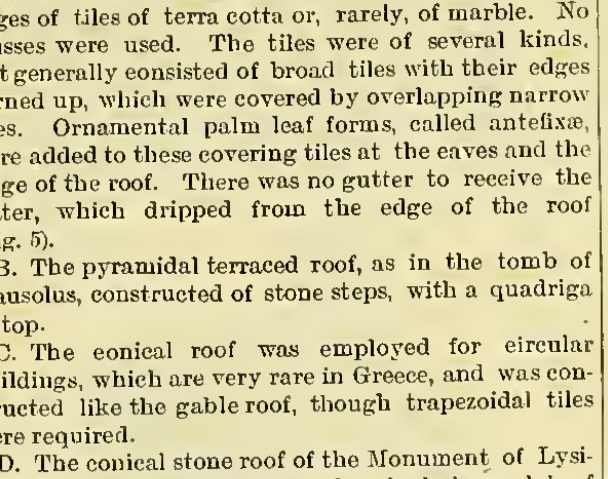


Fig. 6.

In early Grecian buildings, the decorations were merely painted on the surface of the moulding; in later, especially in connection with the Ionic or Corinthian orders, they were usually sculptured in low relief.

More complex profiles were probably preferred to circles for Grecian mouldings, because the gradation of the shading and shadows would be more delicate and beautiful, thus harmonizing better with the architecture. This became evident when executed in white marble, though this refinement would be useless if a dark stone were employed. The cost was thereby considerably increased.

The principal forms of mouldings were the following:

A. *Rectilinear* (Fig. 6).

1. *Fillet.*—Profile rectangular. Also a flat surface used for separating two curved surfaces or to terminate a moulding.

2. *Ovolo.*—Profile convex, usually a little more than half an ellipse, parabola or hyperbola, whose axis is horizontal. Most curved at top and separated from the fillet by a deep quirk. Sometimes used as a corona, more frequently as one of a group of mouldings.

3. *Egg and Dart.*—Simply a sculptured ovolo. Rare in the Doric order, but very common in the Ionic.

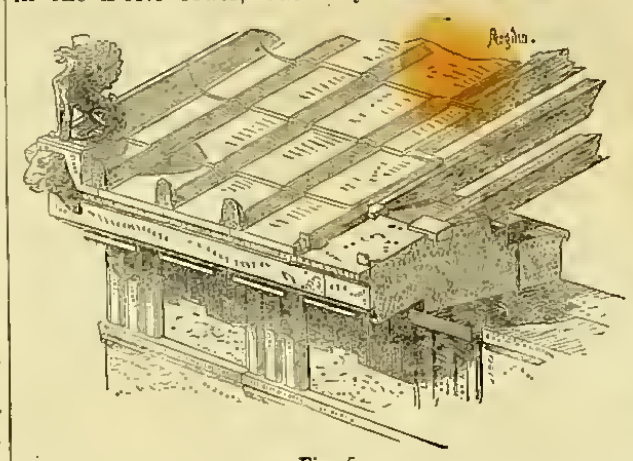


Fig. 5.

Frequently used in combination with the headed astragal.

4. *Cavetto.*—Profile similar to that of the ovolo, but concave instead of convex. Rare, used as a corona or to form a group.

5. *Cyma Recta.*—Composed of a cavetto and ovolo tangent to each other, the former always being uppermost. Chiefly employed as a corona, for which purpose it is still used, this special section of moulding now being generally termed "crown mould."

6. *Cyma Reversa.*—Composed of an ovolo and cavetto, the ovolo being uppermost, making the profile the reverse of that of the cyma recta. Sometimes used as a corona, but more frequently as a bed moulding, etc.

7. *Lesbian Cyma.*—Composed of a cyma reversa above a beaded astragal, both always being sculptured. Or it might be considered as being an egg and dart moulding and beaded astragal, the lower portion of the first being concave instead of convex. Very frequently used as a bed moulding, also to separate the frieze and architrave of the Ionic and Corinthian orders.

8. *Hawksbill.*—Probably composed of intersecting ovolo and cavetto, usually with a necking and one or more fillets beneath it when used in the capitals of antæ. Common in capitals of antæ, also sometimes found in cornices, forming a drip moulding.

9. *Astragal.*—Profile usually semicircular if small, or semi-elliptical if large. Not common as a plain moulding.

10. *Beaded Astragal.*—Profile like that of the astragal, excepting that it sometimes forms three-fourths of a circle; decorated by being cut into alternating oblong beads and pairs of disks, connected by a kind of stem. This moulding was a favorite, and was much used in composing groups of mouldings, etc.

B. *Annular Mouldings.*—(Fig 7.) Only employed for the caps and bases of circular columns.

1. *Fillet.*—Profile like that of straight moulding and used for the same purposes. The name is also applied to the narrow strips of the original surface of a column, left between the flutes of the Ionic and Corinthian orders.

2. *Incision.*—Merely an angular notch separating the capital and shaft of a Doric column. Two or three incisions are usually grouped together.

3. *Annulets.*—Annular mouldings of peculiar profile, a group of 3, 4, or 5 being placed between the echinus and necking of the Doric capital.

4. *Echinus.*—Profile like that of the ovolo; usually decorated by painted leaves with their points downward, or by sculptured ornaments similar to those of the egg and dart moulding. This is the principal moulding of the Doric capital, just beneath the abacus.

5. *Cavetto.*—Similar to the straight cavetto.

6. *Scotia.*—Profile concave, but comprising a larger portion of the curve than the cavetto; employed only on the base of a column, usually between two toruses.

7. *Torus.*—Profile convex, usually semi-elliptical; decorated either by shallow horizontal flutes or by sculptured interwoven bands. The lowest moulding of the base.

8. *Apophyge.*—A concave surface of quadrant profile, which is used to connect the capital or base of a column with its shaft.

9. *Beaded Astragal.*—Like the straight moulding, and generally placed between the necking and shaft of Ionic and Corinthian columns.

10. *Astragal.*—Profile semicircular, surface plain; sometimes found in the Ionic base.

8. *Columns and Antæ.*—Grecian columns are always circular, and are also free, *i. e.*, are very seldom attached to a wall; antæ are pilasters of rectangular section, which frequently terminate the side walls of temples.

The antæ were built of courses corresponding to those of the adjacent walls, but the columns were composed of cylindrical drums of stone, so cut as to bear only on their outer edges. A square hole was sunk at the center of each end of a drum, which was filled with a tightly driven block of wood. A round wooden pin in the middle of this block then connected two drums and also formed a center, around which the upper drum could be rotated while grinding the joints with sand. Only the capital and lower drum were cut before setting up the column, the others being rough. The outline of the shaft could then be made curved or straight as desired, by using a wooden template, the flutes laid out and worked with much greater ease and certainty than if the column had been completely finished before setting. (See Fig. 1.)

Diminution of Columns.—All Greek columns were diminished, *i. e.*, were smaller just below the capital than at the lower end of the shaft. This diminution was greatest in the early Doric buildings, but was gradually lessened as the ratio of height to diameter was increased. It varies from one-third to two-fifteenths of the lower diameter of the shaft, being in the best examples about five-twenty-fourths for the Doric and one-sixth for the Ionic and Corinthian orders.

Doric antæ were necessarily diminished, since the walls were battering, but they were plain and not fluted.

Entasis of Shaft.—The vertical outline of the shaft of a Grecian column was rarely straight, but was usually slightly curved and convex. This is the *entasis*, which was usually quite small, though materially affecting the appearance of the column. The shafts of the external columns of the Parthenon are 27½ feet high, and their curvature is such that their middle diameter is ⅝ inch more than if the outlines were straight, about $\frac{1}{110}$ part of the lower diameter of the shaft, making an entasis of only $\frac{5}{8}$ inch. The probable object of this entasis was to prevent the outline of the column from appearing concave. The curve of the entasis may have been circular, though it appears more probable that it was a portion of some higher curve, since the mode of working equally permitted the use of any plane curve.

Proportions of Columns.—The ratio between height and lower diameter of shaft was least in early Doric columns, but was gradually increased. It was at first 4, then 6 in Doric columns of the best period, from 9 to 10 for Ionic, and from 8·8 to 10·7 for Corinthian columns. These ratios are all smaller than those employed in modern architecture.

Inclination of Columns.—Their axes were rarely exactly vertical, but were slightly inclined toward the building, to increase its apparent strength; the angle columns were inclined more, because on two sides. To further increase this effect of stability, the angle columns were usually a little larger than the intermediate columns.

Intercolumniations or Spacing of Columns.—The angle column and triglyph of a Doric building were both set close to the corner; the centers of all other columns were set under the centers of each alternate triglyph, or rarely under each third triglyph. This made the intercolumniation next the angle less than the others, thus further increasing the apparent stability of the corner. But the position of each column was rigidly fixed, once the diameter of the shaft and number of columns had been decided. The distance between centers of columns was generally 2·6 diameters. (See Fig. 2.)

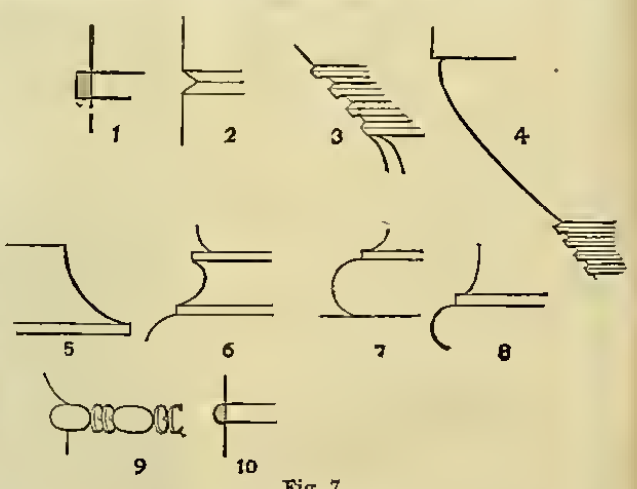


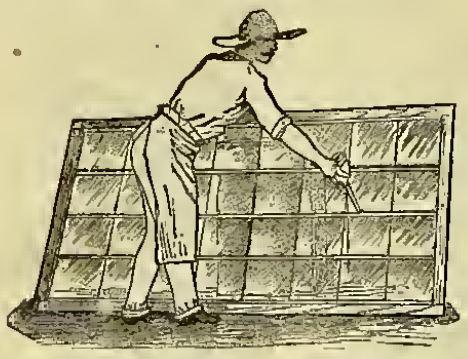
Fig. 7.

Since the frieze of the Ionic or Corinthian order was not divided into triglyphs and metopes, these columns could be set as desired, though necessarily equidistant. Distances between centers vary from 2½ to 4 diameters,

A NEW METHOD OF GLAZING SASH.

BY PETER HENDERSON.

It is well known that all glass now (both in portable sashes and in fixed greenhouses) is simply embedded in putty, and kept in place by glaziers' points, no putty being now used on top, as was formerly done. It has been found that when the glass lies on the sash bar thus embedded, the putty soon rots or wears out, and water gets in, and not only loosens the glass, but rots the bar as well. A most simple plan to obviate this is to pour along the junction of the bar with the glass a thin line of white lead in oil, over which is shaken dry white sand. This hardens, and makes a cement that effectually checks all leakage. It is quickly done. Our engraving shows how the portable sash is held, and the application made from the oil can containing the thin white lead. I have seen glass, so cemented, that has stood for ten years,



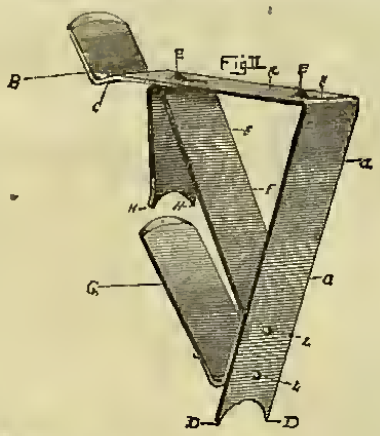
IMPROVED METHOD OF GLAZING.

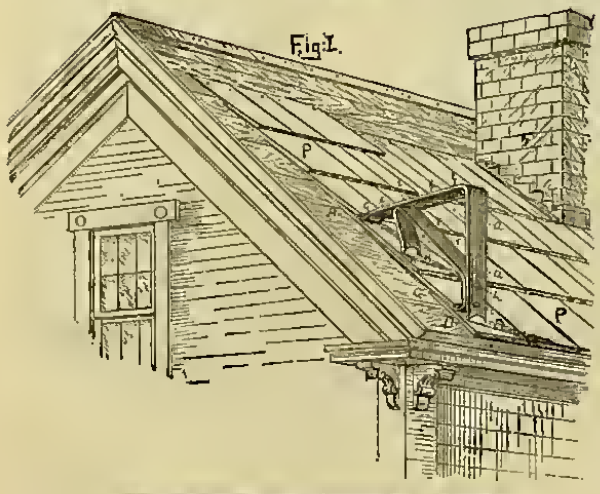
still in perfect order, and it looked as if it would stand for ten years more without further repair. This plan, which is but little known as yet, is of the greatest importance; had I known of it thirty years ago, I would have saved many thousands of dollars in repairing, besides having the plants under this water-tight glazing in better condition.—*American Agriculturist.*

NEW ROOFING OR STAGING BRACKET.

BY HENRY E. TOLMAN, SHELBURNE, MASS.

To use this invention, the bracket is grasped so that the projection, B, is pointed toward the ridgepole of the roof. The projections, B and G, are then forced or pushed under the shingles until the shoulder, C, rests against the base of the shingle under which the projection, B, is placed. This brings the spurs, H H and D D, so that the same rest upon the roof, and thus, after two or more are placed in their proper position,





NEW ROOFING OR STAGING BRACKET.

my brackets are ready to support the boards or staging, as shown.

Adamant—A New Invention.

Prof. Carl Straub, of Syracuse, N. Y., has invented a new cement or artificial stone, for which he has obtained a patent. By years of patient study and experiment, he has produced a material which is believed to be of value, especially to the building trade. His production, with various changes, can be used for wall plaster, for tiles and flooring, plastic work, artificial marble, and granite. He has given the name of "Adamant" to the wall plaster, and "Chromoleth" to the finishing material, either white or colored. It is prepared ready for use by simply mixing with water and applied in the usual manner.

It is a chemical composition, and in a few hours after being applied it is said to become hard as marble, and capable of resisting intact all the ordinary casualties that prove so destructive to common plaster.

Among many other advantages, the inventor says adamant saves time and labor; it can be applied as well in winter as in summer; it avoids saturating the timbers with water, and the consequent warping and shrinking; it saves waiting weeks for the rooms to dry out, and they can be safely occupied next day after finishing.

It adheres equally well to lath, brick, or iron, and will last as long as the building.

Carpenters need not move out while the plastering goes on, but can work right along on the same floor with the plasterers.

Adamant will not crack or shrink; rats will not gnaw through it, nor will it harbor vermin, noxious gases, or germs of disease, like common plaster, because it is smooth, dense, and hard, instead of porous. It places much less weight on the building than plaster, and instead of being a dead weight, it contributes strength. It can be treated with any desired finish.

The Bee's Sting a Useful Tool.

A new champion has arisen to defend the honey bee from the obloquy under which it has always rested. Mr. Wm. F. Clarke, of Canada, claims to have discovered, from repeated observations, that the most important function of the bee's sting is not stinging. In a recent article he says:

My observations and reflections have convinced me that the most important office of the bee sting is that which is performed in doing the artistic cell work, capping the comb, and infusing the formic acid by means of which honey receives its keeping qualities. As I said at Detroit, the sting is really a skillfully contrived little trowel, with which the bee finishes off and caps the cells when they are filled brimful of honey. This explains why honey extracted before it is capped over does not keep well. The formic acid has not been injected into it. This is done in the very act of putting the last touches on the cell work. As the little pliant trowel is worked to and fro with such dexterity, the darts, of which there are two, pierce the plastic cell surface and leave the nectar beneath its tiny drops of the fluid which makes it keep well. This is the "art preservative" of honey. A most wonderful provision of nature, truly! Herein we see that the sting and the poison bag, with which so many of us would like to dispense, are essential to the storage of our coveted product, and that without them the beautiful comb honey of commerce would be a thing unknown.

If these things are so, how mistaken those people are who suppose that a bee is, like the Prince of Evil, always going about prowling in search of a victim. The fact is that the bee attends to his own business very diligently, and has no time to waste in unnecessary quarrels. A bee is like a farmer working with a fork in his hay field. He is fully occupied, and very busy. If molested or meddled with, he will be very apt to defend himself with the implement he is working with. This is what the bee does; and man, by means of his knowledge of the nature and habits of this wondrous little insect, is enabled, in most cases, to ward off or evade attack. It is proof of their natural quietness, industry, and peaceableness that so many thousands of them will go through a summer of ceaseless activity close to your dwelling house, and perhaps not half a dozen stings be inflicted during a whole season.

Paris Cement.

A new cement, called "cement de Paris," has been introduced in France, the inventor and manufacturer of which is M. Vallin, the director of a French cement works, the Gypserie de la Gare. The new material is stated to be at least equal, if not superior, in quality to the English article, while it can be sold at the rate of 2s. 6d. to 5s. per cwt. This material is said to possess durability and the cold appearance of marble, and a wall rendered, floated, and set with it becomes impermeable to moisture. It can also be polished, and made to present an elegant appearance. In the usual method of manufacturing cement, it is generally found very difficult to obtain a thorough burning of every piece of clay or stone; sometimes the surface of it is burnt too much and the center too little or not at all. The result is that, after the clay or stone is crushed, it contains a considerable quantity of unburnt grains, which play the role of an inert material, and which people pay for as cement. In order to avoid this unequal burning, M. Vallin, instead of crushing the material after, does so before placing it in the kiln. A crushing mill breaks it into small pieces, which are automatically conveyed to a vertical cylinder mill, whence they issue ground to powder. This is in turn again automatically placed on sieves, which shift it into pans or kilns heated by gas. A series of inclined plates, having a gyratory motion, agitate the powder in each of the pans, and thus render every particle of it amenable to the action of heat. Finally, a mechanical arrangement conveys it to sacks, which a man fills as the powder arrives. The whole operation is thus continuous and automatic, which of itself is a great advantage. But still more important and appreciable is the fact that all the particles of the cement are thoroughly burnt. M. Vallin estimates that his method enables him to effect a saving of about 30 per cent over those ordinarily adopted. Besides the homogeneity of the particles, the other advantages claimed for this cement are its great whiteness of color, durability, and freedom from liability to unequal shrinkage, which causes fine cracks.

COMBINED HAMMER AND PLANER.

BY CHARLES F. BRENT AND ALFRED LANG, OF MOUNT VERNON, O.

In fitting up siding, cornice, and casings, and for various other work, our improvement is of advantage,

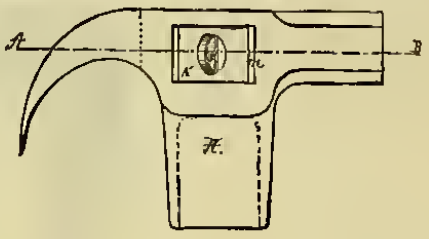


Fig. II.

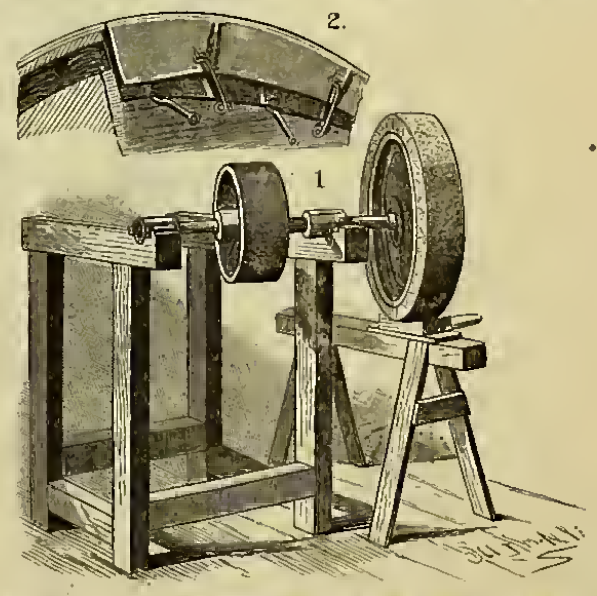
COMBINED HAMMER AND PLANER.

for in case a board after being sawed does not fit, it may be planed, and thus made to fit, by our combined hammer and plane, thus avoiding the trouble of carrying a plane specially for that purpose.

The hammer, H, is provided with an opening, *m*, which extends from side to side, and the rear wall of this opening is inclined and forms a bed for the bit, K, which is secured thereto by the set screw, S. The front wall is straight or at right angles to the sides or longitudinal center of the hammer. A throat is thus formed through the body of the hammer from side to side, which is contracted at one end and widened at the other end. The edge of the bit projects through the contracted end of the throat, and the butt or heel is located within the widened end.

SANDPAPERING AND POLISHING MACHINE.

The accompanying engraving illustrates a sandpapering and polishing machine, which is the invention of Mr. T. B. Marshall, of Sidney, Ohio. With this machine either a flat, oval, or concave surface can be sandpapered and polished with the grain of the wood. To the peripheral face of the wheel, which is of any suitable size, say 24 inches, are secured springs shaped as shown in Fig. 2, and placed as close together as possible. A hand of felt is placed about the springs and held in position by a strip of sacking or canvas, the edges of which are corded. This strip is held in place



MARSHALL'S SANDPAPERING AND POLISHING MACHINE.

and prevented from creeping by hooks secured to the side of the wheel by nails. The sandpaper is applied so as to rest smoothly upon the peripheral surface of the wheel, the edges being bent over and crimped and secured to the sacking by safety pins. The wheel is mounted upon a shaft driven in any convenient way. The work to be smoothed and polished is pressed against the surface of the rapidly revolving wheel. This machine has been practically tested, and has given most satisfactory results.

AN attempt to smoke out a 'coon resulted in the burning of a thousand acres of timber land in New Hampshire.

DESIGN FOR A TOMB.

This design is presented in the hope that it may contain useful suggestions for those of our readers who have occasion for work of this nature. The illustration is from *Architektonische Rundschau.*

Home Furnishing.

A writer for the Household Department of the *Cosmopolitan* thus pleasantly chats about home furnishing and decoration:

There is an individuality that attaches itself to every home. Fashion and custom, it is true, assert themselves in the furnishing, but the touch that makes one home different from another is that of the woman who reigns there. The love of order or of comfort is quite as apparent on entering some houses as in others, the eye for color that has placed a drapery of olive here or a scarf of garnet there, so that our homes may well be said to be the expressions of our feelings. And in this age of beautiful colors, of fabrics within the reach of all, there seems to be no excuse for unattractive surroundings.

In furnishing a house, be it large or small, it is well that the hall, which affords the first glimpse we have of the interior, should have an air of welcome. This can easily be maintained if the hall has breadth, and need not be entirely lost sight of in the narrower halls. The coloring in halls should be rich, and the light subdued. If gas is used, let the globes of the fixtures be of deep coloring—the olives, deep red, and orange. These all make good tints, and combinations of them are delightful. In broad halls with high ceilings, tapestry hangings and heavy pieces of metal work are beautifully decorative and in good keeping if the house is large. If the hall has unusual breadth, an open fireplace is desirable, especially in the country house, as there the hall may have a domestic air.

If the hall is very narrow, and the stairs near the front door, it will prove to be an obstinate affair. Portieres can be hung under the casings of the doors; and if it has a vestibule entrance, and the inner doors have glass panels, shirrs of soft China or India silk, figured or plain, will help to furnish. If there are double doors and only one is to be open at a time, there may be space in the corner for a small stand and a large vase or bowl of flowers. In such a hall the hat rack should not be the prominent feature. A small one is much more attractive.

The expanse of a long drawing room may be relieved by a cozy grouping of chairs and tables in the front, and perhaps a desk and piano, and thus leave the lower end for the more secluded *tete-a-tete.* If the piano is an upright, it will break the length of the room by being drawn out at a slight angle from the wall, and a scarf in light material thrown over it, not festooned. Square parlors are much more homelike, and better suited to people of moderate means. The light being usually stronger, the effect of color is more apparent. A room finished in cherry, or with wood painted dark red, may be papered with olive slightly blended with light blue, and a deep cream ceiling. One painted in dark green may have the same shade in paper, with a frieze of salmon, and a garnet ceiling. The same colors may predominate in the rugs. Madras curtains are in good taste in small parlors, with or without heavier ones.

The tone of the dining room should be warm and genial; that which comes through the rose stained upper sashes of windows, or chandeliers, or by means of candles with small red shades, is soft and pleasing. Where there is no stained glass a very good effect is gained by a sort of patchwork, contrived with the decorated pieces of crinkled Japanese material that are found in almost all the fancy stores nowadays. They are about five by seven inches in size, brilliant in coloring, and, when put together with satin ribbons two inches wide, of any color desired (deep red or purple perhaps), and tacked securely to the casing of the window, the result is marvelously pretty.

The dining room, of all rooms in the house, should be comfortable. An Oriental couch, without ends, and with big pillows at the back, may afford an after dinner rest, and easy chairs on each side of the open fireplace give an opportunity for a half hour with the morning paper, or a snug corner to plan the day's work. It is unfortunate to load the room with decorative china and tiers of plaques, and a great display of silver is vulgar.

The beautiful colors that are brought out in the heavy materials are repeated in goods of lighter weight. Silesias and sateens come in every possible shade and color, and the heavier sateens, such as upholsterers use to line heavy draperies, make in themselves attractive hangings. These can be trimmed with the small tassel fringe. This cannot always be purchased in the shade desired, but any woman with deft fingers can make it at odd moments, by forming tassels about one and one-half inches long of crewels, and crocheting a tiny border to hold them together, which can be sewed to the edge of the curtain.

A TOMB IN BOLOGNA.—DESIGNED BY EISENLOHR & WEIGLE ARCH. STUTTGART.

How to Darken Oak.

A correspondent in the *English Mechanic* gives the following process of treatment, which he considers the best, after trying the various other processes used by builders and cabinet makers to darken woods: "Oak is fumigated by liquid ammonia, strength 88°, which may be bought at any wholesale chemist's at 5s. a gallon. The wood should be placed in a dark and air-tight room (in a big packing case, if you like), and half a pint or so of ammonia poured into a soup plate, and placed upon the *ground* in the center of the compartment. This done, shut the entrance, and secure cracks, if any, by pasted slips of paper. Remember that the ammonia does not touch the oak, but the gas that comes from it acts in a wondrous manner upon the tannic acid in that wood, and browns it so deeply that a shaving or two may actually be taken off without removing the color. The depth of the shade will entirely depend upon the quantity of ammonia used and the time the wood is exposed. Try an odd bit first experimentally, and then use your own judgment."

Brick Pavements.

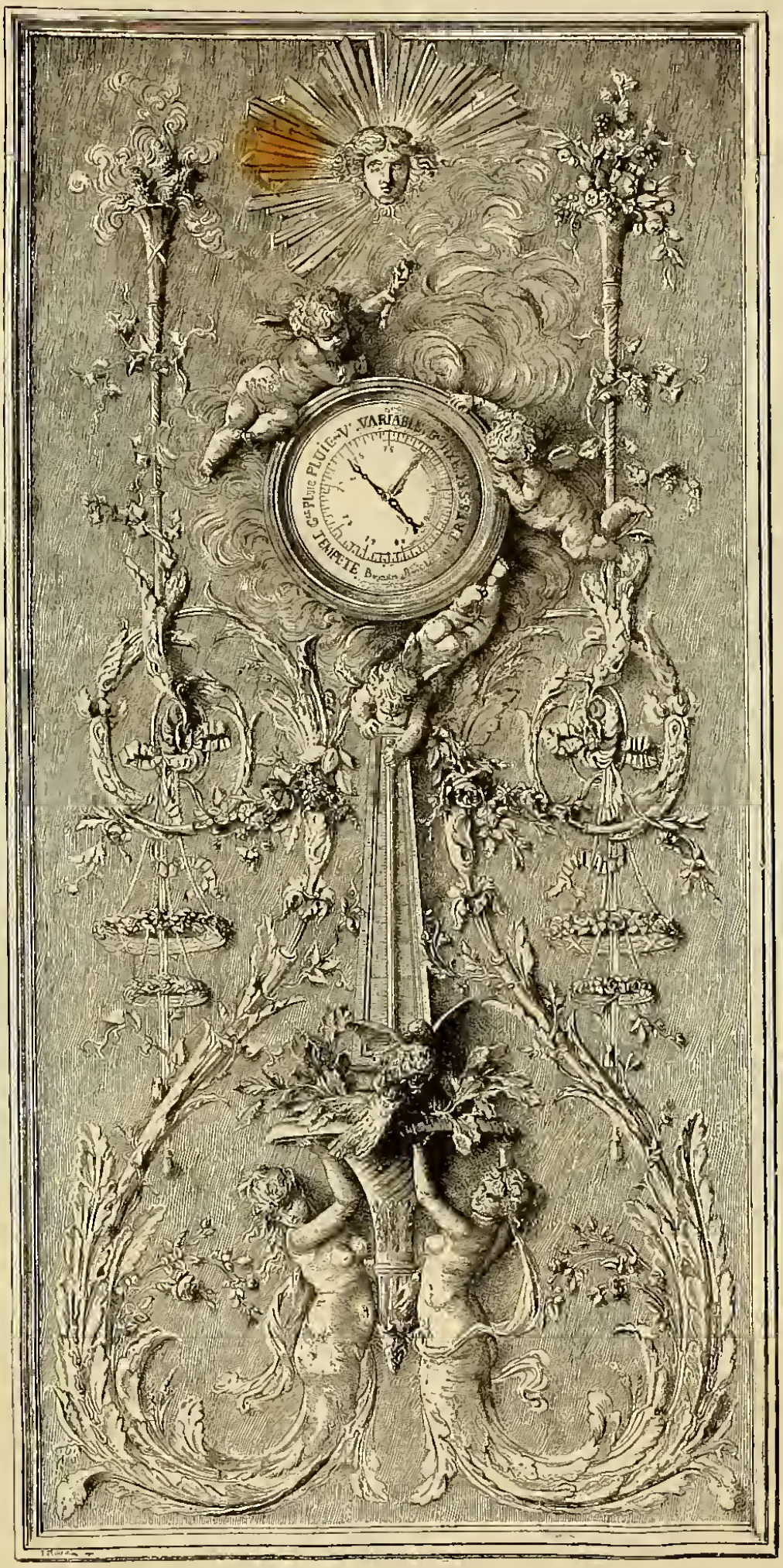
Within the past few years, several towns in the Western States have been experimenting with street pavements of brick. Many miles of brick pavement, it is needless to say, exist in Holland, and, if we are not mistaken, there are remains of brick in the streets of Nantucket, but elsewhere in the United States this material has been rarely, if ever before, used for the purpose. According to the *Engineering News*, Bloomington deserves the credit of being the first modern town in this country to introduce brick paving on an extensive scale. The town is situated in a clay region, and bricks are cheap there, as well as good, and by careful selection of material it has been found possible to produce bricks so tough and hard that in Bloomington, where seven miles of streets are now laid with them, they have been found, after ten years' experience, durable, as well as cheap and convenient. In Amsterdam, where, although canals intersect the city in all directions, a good deal of traffic is carried on by means of horses and wagons, the pavements of small, whitish bricks show little sign of wear, and, partly on account of their porosity, and partly from the numerous joints which exist between them, they are in wet weather much drier and pleasanter to walk over than stone, or even asphalt. In the Illinois town, the street is prepared for paving by forming the natural surface into the proper profile; on this is then laid four inches of coarse sand or cinders, evenly spread, cinders being preferred on account of the better drainage which they afford, and the whole is covered with bricks laid flat, with joints as close as possible, and accurately formed to the desired profile. Fine sand is then spread over the surface, and worked well into the joints with a broom, and, after laying an inch more of sand over it, the top course, consisting of bricks on edge, is set, as closely as possible, and the joints of this also well filled with sand. The multiplicity of joints makes the pavement easy and safe for horses to travel over, and the whole cost is only from one dollar and forty cents to one dollar and eighty cents per square yard.

How to Measure Bridge Deflection.

A novel method of measuring the deflection of railway bridges has been tried in Russia. An iron pipe, 1½ in. in diameter, was carried along the outside of one girder. From this pipe, at each abutment at the pier, and at five intermediate points on each span, vertical pipes of the same diameter branched out. Inside, and near the top of each vertical pipe, was fixed a graduated ¾ in. glass tube, the iron pipe being cut away on both sides. The zero divisions on the tubes were all the same distance above the flange of the girder. Before the bridge was loaded, the apparatus was filled with water, the tops of the upright pipes covered over, and the water was then drawn off until it stood at zero in each gauge. On the bridge being loaded, the deflection could be read with ease.

CARVED DESIGN IN BOXWOOD.

Our engraving shows an etching recently given in the London *Architect*, representing a barometer and thermometer holder. It is one of Champollion's works. Those who are looking for graceful ornamental lines may find something useful in this design.



BAROMETER AND THERMOMETER IN CARVED BOXWOOD.

A Lumber Roller.

Some genius about a planing mill has invented a device for unloading the wagons on which the lumber is hauled for dressing, which is so simple and practical that it is a wonder, as it usually is in such cases, that it was not thought of before. The platform on which the lumber is ordinarily piled as it comes into the mill is raised to just about the height of a wagon, so that, as the load is backed up, the rear end projects over it. A slight depression in the roadway, just in front of the platform, permits the wagon to drop a few inches, and allows the weight of the load to rest upon the edge of the platform. Close to this edge, a live roll is placed, which is given a positive motion by a link belt connection, and behind it are put ordinary dead rolls at suitable distances. The operation of the device will be apparent without further explanation. As soon as the load of lumber rests upon the live roll, it begins moving into the mill, seemingly of its own accord; and sooner than a half dozen boards could be removed from the load by hand, the entire jag is quietly rolled into the mill without handling. It is best to place rollers on the wagon also, in order to make the load move easily and promptly as soon as it rests upon the live roll. To a planing mill operator doing a large business, and who is compelled to employ a number of men and teams to handle the lumber that comes in to be dressed, the value of this little device will be perceived at a glance. The saving in time makes it possible to do the same amount of work with a less number of teams, and with a notable economy of labor for the teamster. It has been applied to the new mill of the Ludington, Wells & Van Schaick Company, at Menominee, Mich., where an ordinary six inch wrought iron pipe, polished, is used for the live roll, being connected with the line shaft with suitable belts and pulleys to secure the proper speed. The beauty of the arrangement is that it is not patented, and may be used by any one. It is said to have been invented by a man at Eau Claire, who certainly deserves the thanks of the planing mill fraternity for his ingenuity.—*Timberman.*

Cleaning Waste Pipes.

A correspondent of the *Am. Artisan* says: The annoyance arising from the stoppage of waste pipes in country houses, although very great, is but a small matter compared with the dangers which may follow obstructed pipes. The "sewer gas" about which so much has been written, and which is so justly dreaded, is not, as many suppose, the exclusive product of the sewer. Indeed, the foulest, most dangerous and deadly gases are not found in sewers themselves, but in the unventilated waste pipes and those which are in process of being clogged by the foul matter passing through them. Any obstructions in the soil or waste pipes are therefore doubly dangerous, because it may produce an inflow of foul gas into the pipe, even though the entrance to the sewer itself has been entirely cut off.

The question is how to get rid of the accumulations in pipes partly stopped or already closed. Digging up and cleaning out is a costly remedy, often ineffectual by reason of careless workmen. The second is the plumber's force pump, which is usually only a temporary relief.

In pipes leading from the house to the cesspool there is a constant accumulation of grease. This enters as a liquid and hardens as the water cools, and is deposited on the bottom and sides of the pipes. As these accumulations increase, the waterway is gradually contracted till the pipe is closed. When the pipe is entirely stopped, or allows the water to fall away by drops only, proceed thus: Empty the pipe down to the trap, as far as practicable, by "mopping up" with a cloth. If water flows very slowly, begin when the pipe at last emptied itself. Fill the pipe up with potash, crowding in with a stick. Then pour water upon it in a small stream, stopping as soon as the pipe appears to be filled. As the potash dissolves and disappears, add more water. At night a little heap of potash may be placed over the hole and water enough poured on, so that a supply of strong lye will flow into the pipe during the night. Pipes that have been stopped for months may be cleaned out by this method, though it may call for three or four pounds of potash. The crudest kind, however, appears to act as well as the best. If the pipe is partially obstructed, a lump of crude potash should be placed where water will drip slowly upon it and so reach the pipe. It is also well to fill the upper part of the pipe with the potash, as before, and allow hot water to trickle upon it. Soda and potash are both used for the purpose of removing greasy obstructions, and the usual method of application is to form a strong lye and pour it into the pipe.

It is better to put the potash into the pipe, because the water it contains, instead of diluting, helps to form the lye. As water comes in contact with the potash it becomes hot, thus aiding in dissolving the grease. Potash, in combination with grease, forms a "soft" or liquid soap, which easily flows away, while the soda makes a hard soap, which, if not dissolved in water, would in itself obstruct the pipe. When a pipe is fairly cleaned out, the potash should be used from time to time, in order to dissolve the greasy deposits as they form, and carry them forward to the cesspool or sewer. The potash is very valuable for this purpose, because, in addition to its grease-dissolving powers, it is exceedingly destructive to all animal and most vegetable matter.

The most dangerous and deadly gases appear to come from urinals and wash basin pipes, these in many cases seeming to be more foul than those from water closets. The decay of the soap and animal matter washed from the skin appears to be the source of the gases. The potash will be effective in keeping the pipes clear, and in this way may lessen the dangers.

Measurement of Brickwork and Masonry.

Brickwork is measured by either one of four methods, viz.: By the number of bricks it contains; by the number of cubic feet; by the perch of 25 cubic feet; or by the reduced rod, consisting of 272 superficial feet and a width of a brick and a half. The first method is most generally employed, and the cubic foot and perch in a few localities. The reduced rod is the method used principally in England.

To ascertain the number of bricks contained in a wall: First find the superficial area, then multiply by 7½ (the number of bricks in one foot of brickwork 4 inches thick), and then multiply by the number of half bricks in the thickness of the wall. Example: How many bricks does a wall 12 ft. × 20 ft. and two bricks thick contain? Answer, 7,200, viz.: 12 × 20 = 240 × 7½ = 1,800 × 4 = 7,200.

Ashlar masonry, or that which is dressed either on face, bed, or side joints, is measured by the cubic foot; rubble masonry sometimes in the same way, but usually by the perch of 25 cubic feet.

Washboards.

A reporter on the Cleveland, O., *Leader* had a talk with the traveling agent of one of the largest washboard factories in the United States the other day. Said he: "Millions of washboards are made and sold in the United States every year, and at least 7,200,000 are sold yearly between the Alleghenies Mountains and Missouri River. There are two factories in Cleveland which turn out 200 dozen washboards a day, one in Toledo which turns out over a million a year. There are at least twenty different varieties of washboards, and the best washboards are made in the West. The Eastern factories make their washboards of pine. The best wood for washboards is the cottonwood or the sycamore. Pine is too soft, and white pine is too expensive. The best washboards are made with dovetailed heads with wire nails driven across the grain of the wood. You can buy the poorer class as low as 80 cents a dozen at wholesale, and the better boards cost as high as $2.15 a dozen. Double washboards are those that have zinc ridges on both sides. The prices of these run from $1.60 to $3 per dozen. At retail washboards cost 25, 30, 35, 40, and 50 cents apiece. The first washboards were made of wood entirely, and our washerwomen used to pound the dirt out of the clothes with a stick by laying them on a board. The first washboards made of zinc were put upon the market about twenty-five years ago, and the style first invented is found the best to-day."

CARVED OAK ROOM.

The room we illustrate this month has been erected and arranged for Lady Howard de Walden, Datchet, near Windsor. Our engraving is from the *Building News*. The tall carved panels have been adapted to their present purpose (having been previously at an old castle in South Germany) with great taste and skill. Nearly the whole of the oak in the room is old. The ceiling is constructed with massive beams and cross beams, richly carved with the conventional foliage of the period; while the panels thus formed are filled in with a dark painted canvas with good effect. The cornice has been made a satisfactory means of ventilation. It is one of the finest paneled rooms we have seen.

Trade Surveys.

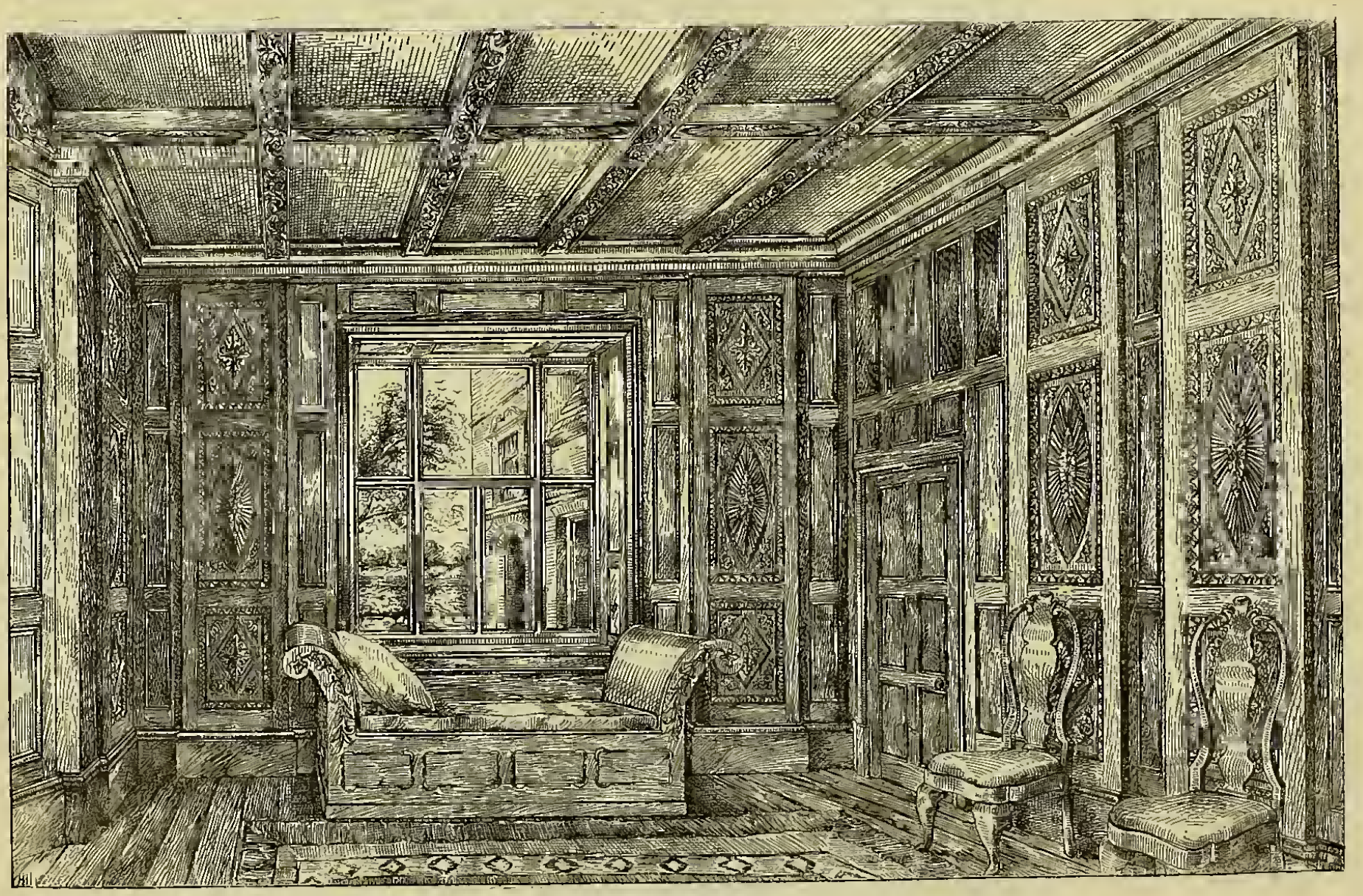
The latest summary of building trade statistics in seven of the larger cities exhibits a rather surprising activity and a very gratifying outlook for the coming six months. The greatest general activity in building is exhibited throughout the West and Northwest. In the city of Chicago the value of permits for the first nine months of this year was $15,953,950 against $13,770,130 for 1885. The value of permits for week ending Nov. 6, against the previous week's, is nearly time last year. The corresponding amounts of money are $201,826,369 and $149,511,513. The number of mortgages recorded in New York city is stated by the same authority to be 10,150, as against 8,433 for same time last year, representing in round numbers $117,000,000 and $86,000,000 respectively. The building statistics of Philadelphia exhibit a similarly active condition in house building, manufacturing, and shop building, and in real estate transfers. Real estate throughout Pennsylvania has been in active demand, and authorities there state that the sale of lots for building purposes to people able and intending to build has been far in excess this year of any previous year. The same activity is found to exist in Western Pennsylvania. A great deal of manufacturing capacity is seeking sites there, attracted by the economical advantages of natural gas. A vast amount of house building is projected by local capitalists for the coming year. Rolling mill capacity is being increased. New mills and furnaces are either projected or under way. The entire natural gas region will, it is evident, become the greatest manufacturing center upon this continent. Through Ohio, especially within reach of the natural gas region, there is a great deal of new building projected. The Ohio Valley is maintaining its prestige as a manufacturing region, but the greater part of the prices, the wonderful expansion going on North and South will meet the extremest requirements of the country. Foreign iron and steel markets are improving, and large orders are now in hand for rails, blooms, billets, crude iron, and other products. The American rail makers have sold one-third of their producing capacity of next year, and the car and bridge builders are hurrying in orders. Both at home and abroad the industrial revival is significant. The activity abroad means higher prices here next year.

The labor question continues to occasion distrust. Employing interests desire a settlement of wages during the winter, yet they do not feel inclined to ask their employes to meet them for that purpose. Organization among employers is growing in many industries. The compacts made have been maintained and are restoring confidence. The unfortunate eight-hour strike at Chicago revives distrust as to the probable future course of the Knights of Labor, but employers generally have faith that, so far as that organization is concerned, there will be no official recognition or aid given to a general movement to that end.—*Amer. Architect.*

Tile Roofs.

The greater comfort experienced in living in buildings roofed with tiles instead of slates is universally acknowledged, for slate, being, like metal, a great conductor of heat, renders the rooms hot in the summer and cold in the winter. Slates are apt, in cold weather, with certain atmospheric conditions, to cause condensation on their inner surfaces, and the moisture collects, runs down, and, lodging on the framework of the roof, causes decay of the lathing and timbers. Tiles are not liable to these objections. Tiles for fire proof coverings are easy to use, and inexpensive. They can be laid on hoop or iron wire rods, instead of pantile laths, and when so done are practically indestructible. Slate, under the action of fire (and particularly if water be thrown on it when hot), cracks and flies in all directions, and the draught occasioned through the apertures thus caused increases flame. Tiles, even when red hot, will still preserve the roof entire.

Tiles have another superiority over slate—they are far more picturesque; and when a roof is treated with ornamental and parti-colored tiles, as in Austria and Bavaria and parts of Holland, the effect produced is excellent, and it would be well to be in more general use, though within the last few years they have been far more commonly introduced.—*Brick, Tile and Metal Worker.*



CARVED OAK ROOM.

double. The building statistics of St. Louis exhibit a smaller increase, but at the same time a very gratifying one. In Kansas City, Omaha, Duluth, St. Paul, and Minneapolis, the increase in permits and in their value certainly points to an active winter and a more active spring. Building material of all kinds is very firm in prices, and in numerous cases contracts have already been entered into for building supplies for the spring. There is also an encouraging degree of building activity in a number of manufacturing and business enterprises between the Lakes and the Ohio Valley. Reports from Springfield, Joliet, Indianapolis, Columbus, Cincinnati, Toledo, Cleveland, and from the manufacturing strip along Eastern Ohio, as well as from Wheeling, Pittsburg, and from Central Pennsylvania, all justify the general and safe conclusion that an extraordinary amount of preparation is being made for building for the coming season. A great deal of the activity will be in manufacturing. There is an urgent demand for more capacity in iron and steel making, in glass making, wagon and carriage making, tool and implement manufacturing, and, in fact, in all the industries connected directly or indirectly with iron and steel using. The building trade conditions farther east are sufficiently familiar. The local building authority in New York city furnishes statistics showing that 3,704 buildings have been planned in that city between January and October, costing $53,119,068, against 2,874 buildings last year, costing under $40,000,000. The total number of conveyances is put at 11,242, against 9,195 for same new enterprises are small concerns, involving an expenditure of $5,000 to $100,000. It is probable that there will be no serious advance in iron and steel or in their products. While trouble is probable in the building trade, it is scarcely possible in the iron trade. The two classes of mill labor are controlled by yearly contracts, one of which expires in January and one in June. All kinds of iron and steel are high and firm in prices, but prices are not likely to be jeopardized by any speculative influences.

The distribution of all kinds of lumber has been remarkable. Mills in the Northwest are, in numerous cases, operated day and night to accumulate stocks sufficient to meet the requirements which the developments of the past two months have shown to be necessary. Freights have been advanced both by lake, rail, and coastwise. Dealers have advanced quotations correspondingly, and buyers are still making haste to cover winter requirements. No scarcity is probable. Saw mill capacity in the Northwest and South has been largely increased, and presumably, therefore, the future supplies will be greater. Lumber manufacturers have been hopeful all along that the cut, now nearly over, would not crowd the market. It is only the extraordinary demand which keeps prices at anything like remunerative limits. The industrial situation generally is strong. Fuel is in active demand, shop capacity is oversold, capitalists feel more inclined to extend their investments in industrial directions, and in view of the general activity and strengthening of

Bakers and Bad Teeth.—Dr. Hesse, of Leipsic, says that bakers suffer especially from dental caries. This is due, he thinks, to flour dust, which gets into the teeth and produces an acid fermentation.

Ten Mile Cannon.

The two largest breech loaders ever made, and, at the same time, the largest naval guns, are those for the English war ship Benbow. Each weighs 247,795 lb., or rather over 110 tons, and will probably carry ten miles. The shell weighs 1,800 lb., and the powder charge, not yet quite decided upon, will be about 800 lb. The "proof" carriage, for guns from 43 to 110 tons, has two four-wheel bogies like those of a locomotive, and four other wheels, braked, between them. The recoil is taken up by a hydraulic cylinder, and there is a loading derrick above the breech. Ships armed with these guns might form a position two miles out from the Coney Island shore, and throw shells into the heart of the city of Brooklyn.

A RESIDENCE OF MODERATE COST.

The illustration herewith presented is that of a frame residence of moderate cost, embracing all modern improvements, and suitable for city or country. The exterior dimensions of the building are 32 feet wide by 48 feet long.

The height of the first floor is 3 feet above the level of the ground, and is reached by wide steps leading to the front veranda, whence a pair of double storm doors open into a vestibule which is made of the proper dimensions to receive a door on each side. The floor of the vestibule is one step lower than that of the main floor, and from it a neat pair of doors, with glass panes, open into the front hall. The latter doors are arranged to swing either inward or outward, so that they can be opened into the vestibule, thus offering abundant space around the sliding doors to the parlor. By the adoption of this plan, the parlor, dining room, and hall can easily be thrown together on occasions of home entertainments. The hall is square in form, being 15 feet 6 inches, and possesses many useful and attractive features.

The parlor is 15 feet wide and 17 feet 6 inches deep. It is lighted by a triple window on the front, and also by a French window on the side, which opens off on the veranda. Sliding doors connect it with the dining room, which is of the octagonal form, having a mullion window in the center, and one in each angle. One of these is a French window, opening to the veranda, thus virtually obtaining an entrance to these rooms on this side. A door leading into the rear hall, and a fireplace in the other, occupy the remaining two angles. By arranging the fireplaces as shown, it will be observed that those of the parlor, hall, and dining room, are all attached to one another, thus obviating much expense otherwise to be incurred. A door leading into the front hall, and a position for the sideboard, are as shown. The recess for the latter is capped over by an arch, so that curtains can conceal the sideboard if it is desired. Immediately adjoining is a door leading into the pantry, which is 8×10, with access to the rear end, lighted by windows on each side. Here is found a soapstone sink and dripboard, for the washing of fine dishes, and ample shelving for the same and for holding victuals; also a secret closet to hold a small safe for the concealment of all valuable silverware.

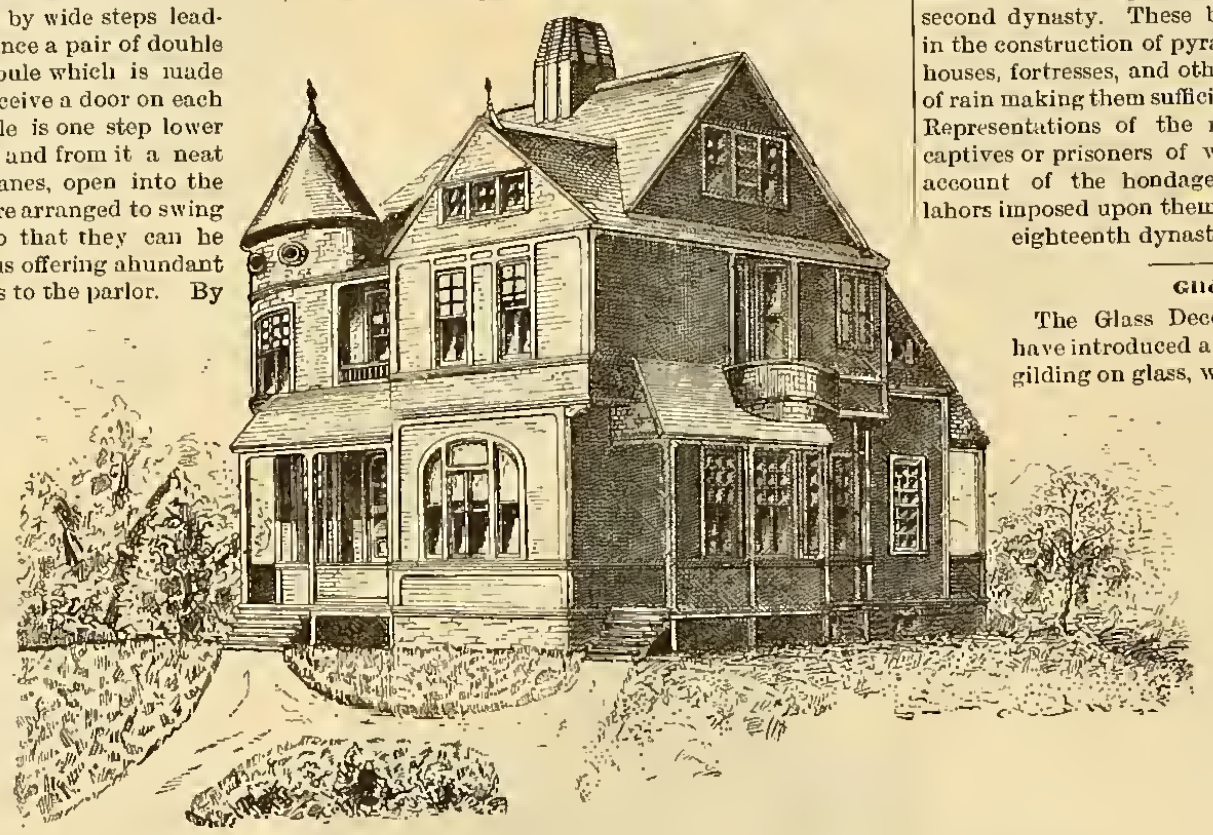
On ascending the front stairs, we land in a corridor three feet and six inches wide, from which each of the principal bed rooms is entered. The first door before you, on landing, enters into a chamber 14×17 feet, located directly over the dining room, and lighted by a neat mullion window, and also by a French window placed in the angle. The latter opens off on a small balcony, formed on top of the roof of side veranda. This room is provided with a fireplace and closet, and has the use of a toilet stand arranged in the entry as shown, and through this room the front room can be reached.

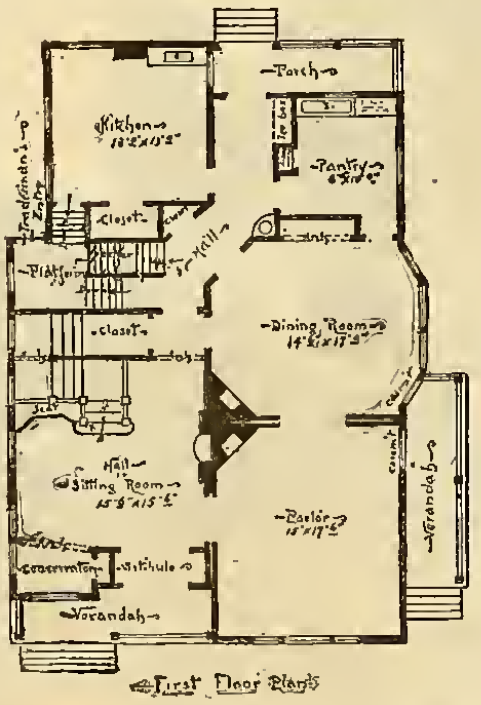
The family bed room is entered from the hall through the entry, or alcove, and is lighted by three large windows; it has a closet, toilet and fireplace arrangements, and is accessible from the side balcony. The alcove, or entry, is separated from the main room by a large archway, is provided with a closet, and lighted by a mullion window, outside of which is a flower balcony.

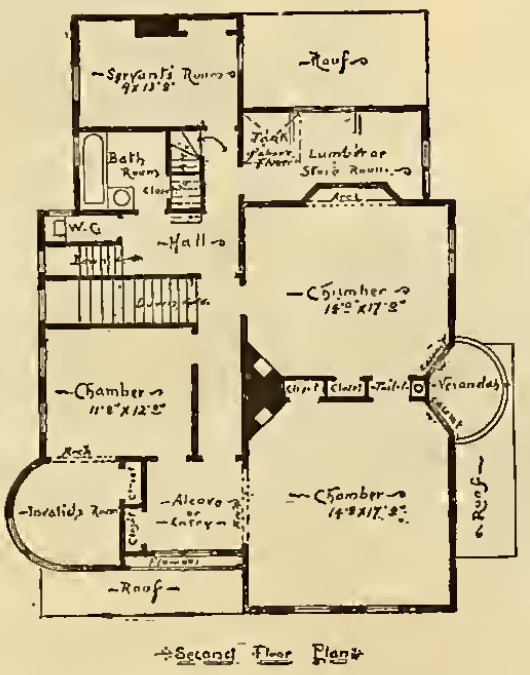
It also connects with an adjoining chamber, which is 11×12 feet, and which is accessible from the hall, and is lighted by two windows. Opening from this is a comfortable room, unique in design, with windows so placed as to afford a wide view. This room is intended to serve as the sick (?) room, when one is necessary; and that connecting with it, as the attendant's. In the latter, all work occasioned by an invalid is performed, and the arrangement is such that by drawing a curtain across the opening, it shuts off much annoyance, which otherwise the patient would be forced to endure. When not used for this purpose, it is well adapted for a nursery, as it connects with the family apartments.

A cellar is excavated under the rear part of the house, as shown, with windows for light and admission of coal. In the rear end, under kitchen, is the laundry, which has a large sink. Adjoining this is an apartment shelved for fruits, jellies, etc., with a window to light it.

The first story will be 11 feet 6 inches, second, 10 feet. We herewith attach a preliminary estimate of the probable cost of such a structure as represented, basing our figures on St. Louis market prices:







ESTIMATE OF COST OF BUILDING AS ILLUSTRATED.

Excavations	$50.00
Rubble masonry	280.00
Brick work	250.00
Lumber	950.00
Mill work	500.00
Tin and copper work	115.00
Plastering	400.00
Painting	225.00
Plumbing	175.00
Stairs	175.00
Mantels and grates	150.00
Hardware	125.00
Labor	600.00
Total	$3,995.00

—St. Louis Architect and Builder.

Egyptian Bricks.

Bricks—*tebi* made in a mould, or sun-dried clay mixed with straw, pounded pottery, and other materials—were extensively used for construction in ancient Egypt. At the earliest period the use of baked bricks was unknown, but some objects of this class occur at the time of the twelfth and following dynasties, of baked red terra-cotta of conical or square shape, the use of which is not decidedly known. The bricks of unbaked clay vary in dimensions from 1 foot 8 inches to 1 foot 3 inches long, and are in thickness from 8½ to 4½ inches, and weigh about 16 lb. The largest are those of the earliest dynasties before the sixth, and they become of smaller dimensions under the eighteenth and following dynasties. At the earlier period, rude marks, spirals, curves, or devices, made by pressing the finger or fingers of the hand into the moist clay, were impressed on the bricks; but at the time of the eighteenth dynasty, stamps were introduced of an oval or square shape, having in relief the prænomen or name of the monarch, or the name or titles of the persons for whose buildings or constructions they were made. The stamps on the bricks commence under the eighteenth and continue to the twenty-second dynasty. These bricks were extensively used in the construction of pyramids, palaces, walls, private houses, fortresses, and other constructions, the absence of rain making them sufficient to withstand the climate. Representations of the making of them by foreign captives or prisoners of war, corresponding with the account of the bondage of the Israelites and the labors imposed upon them, are seen in the tombs of the eighteenth dynasty.—*S. Birch.*

Gilding on Glass.

The Glass Decoration Company, London, have introduced a newly discovered process of gilding on glass, which consists of the deposit of a solution of chloride of gold on the surface of glass, and is similar to the silver process now in use. Considerable decorative effect is obtained by enriching the ground, or surface, by means of eating out devices, such as borderings, the gold thus producing a nice crystalline effect. The glass, in short, may be treated in various ways, by brilliant cutting, drilling so as to form the design or lettering, and then be subjected to the process. The glass name panels, in which the ground is crystallized and the lettering plain gold, show the many different purposes for which the new process is adapted. The names so treated appear very distinct, and can be read at considerable distances, and this application of it will be found of value in the fitting up of saloons, buffets, bars, and church decoration. A drawing room decorated with the gilded glass is to be mentioned. The chimneypiece and overmantel had panels of the decoration introduced with painted floral and other devices in the centers of each, producing a very rich, if not gorgeous, effect. The door, panels, and window linings were also embellished by gilded glass; the former were relieved by medallions of hand-painted floral subjects. We also noticed wall brackets and panels similarly treated. For sideboards and cabinets this kind of glass decoration is well suited, as it can be enriched by hand-painted designs.

Royal Society Medals.

The president and council of the Royal Society have awarded the Copley Medal to Herr F. E. Neumann, of Koenigsberg, foreign member, for his researches in theoretical optics and electro-dynamics, and the Davy Medal to M. J. C. G. G. De Marignac, of Geneva, foreign member, for his researches on atomic weights. Professor Samuel P. Langley, of Allegheny, Pa., has been awarded the Rumford Medal for his researches on the spectrum by means of the bolometer. Mr. Francis Galton, F.R.S., and Professor Guthrie Tait have been nominated for the Royal Medals, the former eminent for his statistical inquiries into biological phenomena, and the latter for his various mathematical and physical researches.

FIRST CONOREGATIONAL CHURCH, MINNEAPOLIS.

Location, cor. 5th St. and 8th Av., S. E.; cost, $60,000. Material, Bayfield brownstone. Architect, W. H. Hayes, Minneapolis. Our engraving is from the *N. W. Architect and Improvement Record*.

Architectural Charges for Professional Practice.

The usual and proper charges of architects for professional work, such as drawing up designs and superintending the erection of buildings, is given in the following schedule, which is issued under the authority of the American Institute of Architects from its New York chapter.

Designing and Supervision.

For full professional services, including the supervision of the buildings during erection, five per cent on the cost of the work. In case of the abandonment of the work, the charge for partial service is as follows:

Preliminary studies	1 per cent.
Preliminary studies, general drawings and specifications	2½ "
Preliminary studies, general drawings, specifications and details	3½ "

For works that cost less than $10,000, or for monumental and decorative work and designs for furniture, a special rate in excess of the above.

For alterations and additions—an additional charge to be made for surveys and measurements.

An additional charge to be made for alterations and additions in contracts or plans, which will be valued in proportion to the additional time and services employed.

Necessary traveling expenses to be paid by the client.

Time spent by the architect in visiting for professional consultation and in the accompanying travel, whether by day or night, will be charged for, whether or not any commission, either for office work or supervising work, is given.

The architect's payments are successively due as his work is completed, in the order of the above classifications.

Until an actual estimate is received, the charges are based upon the proposed cost of the works, and the payments are received as installments of the entire fee, which is based upon the actual cost.

The architect bases his professional charge upon the entire cost to the owner of the building, when completed, including all the fixtures necessary to render it fit for occupation, and is entitled to additional compensation for furniture or other articles designed or purchased by the architect.

If any material or work used in the construction of the building be already upon the ground, or come into possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Supervision of Works.

The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect, or his deputy, of a building or other work in process of erection, completion, or alteration as he finds necessary to ascertain whether it is being executed in conformity with his designs and specifications or directions, and to enable him to decide when the successive installments or payments provided for in the contract or agreement are due and payable. He is to determine in constructive emergencies, to order necessary changes, and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work, and order its removal when not in accordance with them.

Clerk of the Works.

On buildings where it is deemed necessary to employ a clerk of the works, the remuneration of said clerk is to be paid by the owner, or owners, in addition to any commissions or fees due to the architect. The selection or dismissal of the clerk of the works is to be subject to the approval of the architect.

Extra Services.

Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved, at the discretion of the architect.

None of the charges above enumerated cover professional or legal services connected with negotiations for site, disputed party walls, rights of light, measurement of work, or services incidental to arrangements consequent upon the failure of contractors during the performance of the work. When such services become necessary, they shall be charged for according to the time and trouble involved.

Drawings and Specifications.

Drawings and specifications as instruments of service are the property of the architect.

FIRST CONGREGATIONAL CHURCH, MINNEAPOLIS.—W. H. HAYES, ARCHITECT.

A Convenient and Certain Mode for Tempering Steel.

Mr. James A. Peck, of Brewsters, N. Y., mechanical engineer of the N. Y. Condensed Milk Co., gives us the following method discovered by him, and which he uses with great success for tempering all kinds of tools, knives, razors, steel dies, and other implements.

Take a suitable quantity of muriatic acid, dissolve all the zinc the acid will take.

Prepare a tempering bath composed of one part of the above zinc acid and one part water.

Heat the steel according to its hardness.

If high or hard steel, heat until just red and then temper in the acid bath.

If low steel, heat it as hot as you would to temper in water, then temper in the acid bath.

After immersing in the acid bath, cool off in water.

For lathe and planer tools draw no temper; but for other tools draw temper. Unlike water tempering, the colors that appear under this method give no clew to the hardness.

By this process, steel is readily hardened to any desired degree, and may be made to cut glass like a diamond.

If desired, an acid bath composed of two parts of muriatic acid and one part water may be used. Mr. Peck, however, prefers the zinc acid, as being more dense.

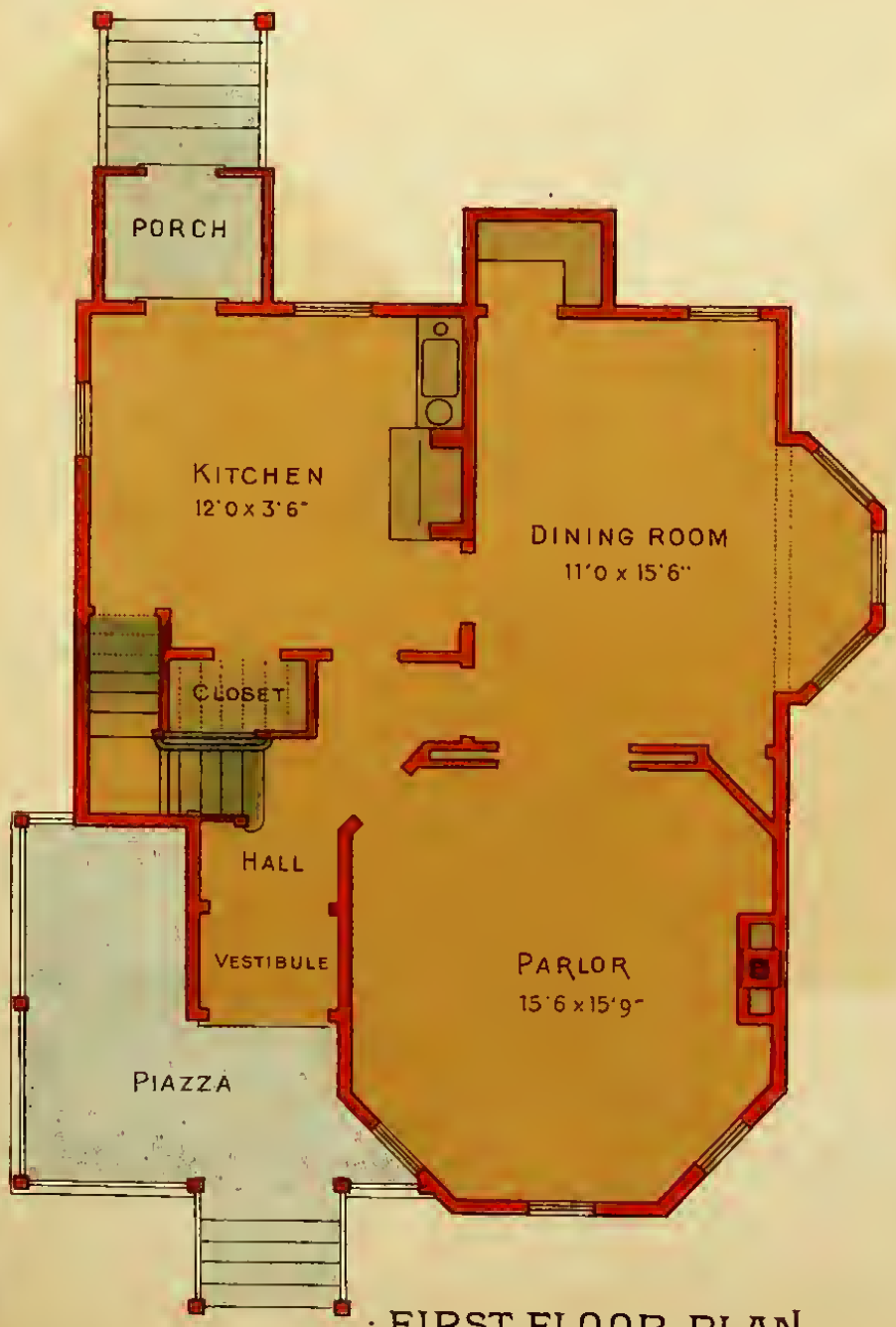
A prominent advantage of this method of tempering is the certainty and excellence of its results. It never fails to yield the temper required. It can be relied upon for every description of steel or tool.

A New India Rubber.

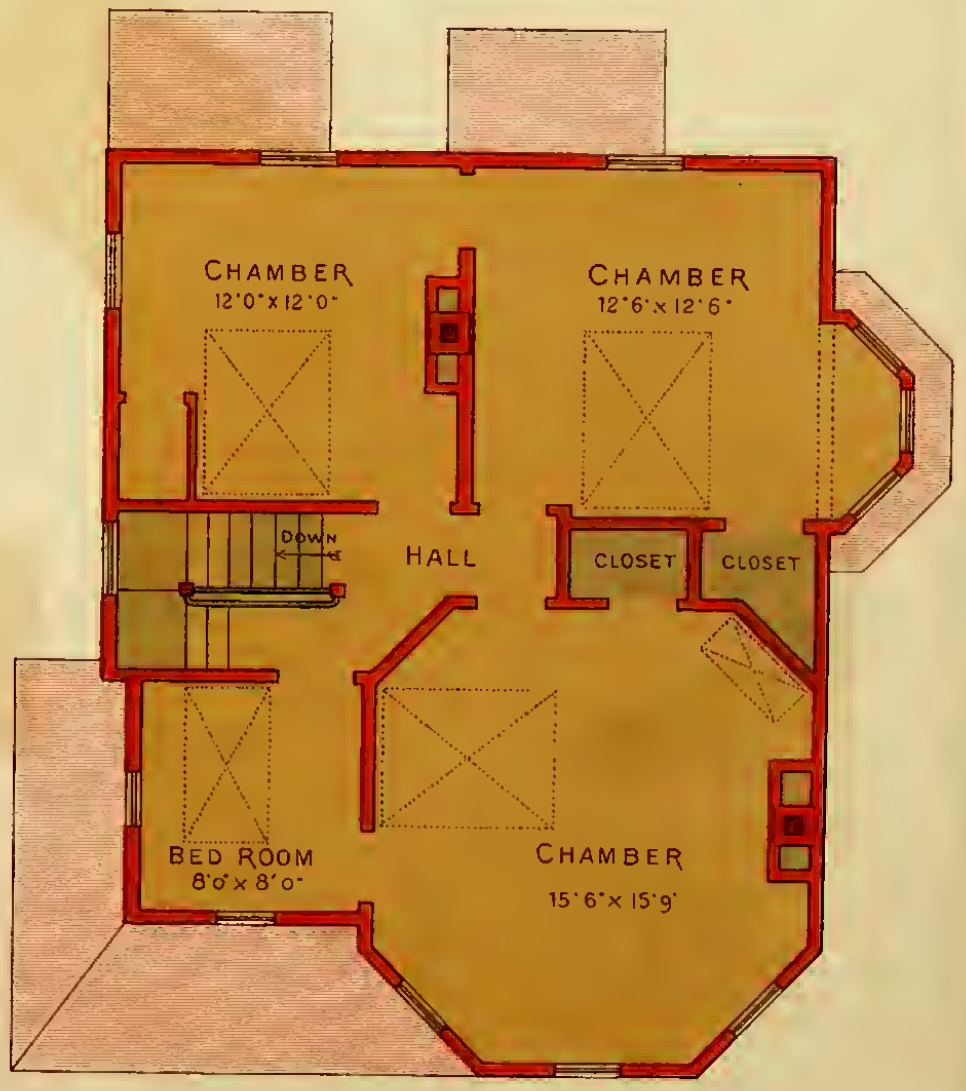
According to the *Bulletin de la Societe de Chimique de Paris*, a plant, the *Sonchus oleraceus*, which grows wild in France in dry places, along roads, and among rubbish, has been found to contain India rubber. This is extracted by treating the plant with sulphuret of carbon, and boiling the residuum with alcohol. The mass is then heated with alcoholic potash, and washed several times with warm diluted alcohol. This removes all greasy and waxy matter, as well as chlorophyl. The residue is elastic, and presents all the characteristics of India rubber. It dissolves entirely in sulphuret of carbon and in chloroform, and partly in ether.

A COUNTRY DWELLING OF MODERATE COST.

B. J. SCHWEITZER, ARCHITECT, NEW YORK



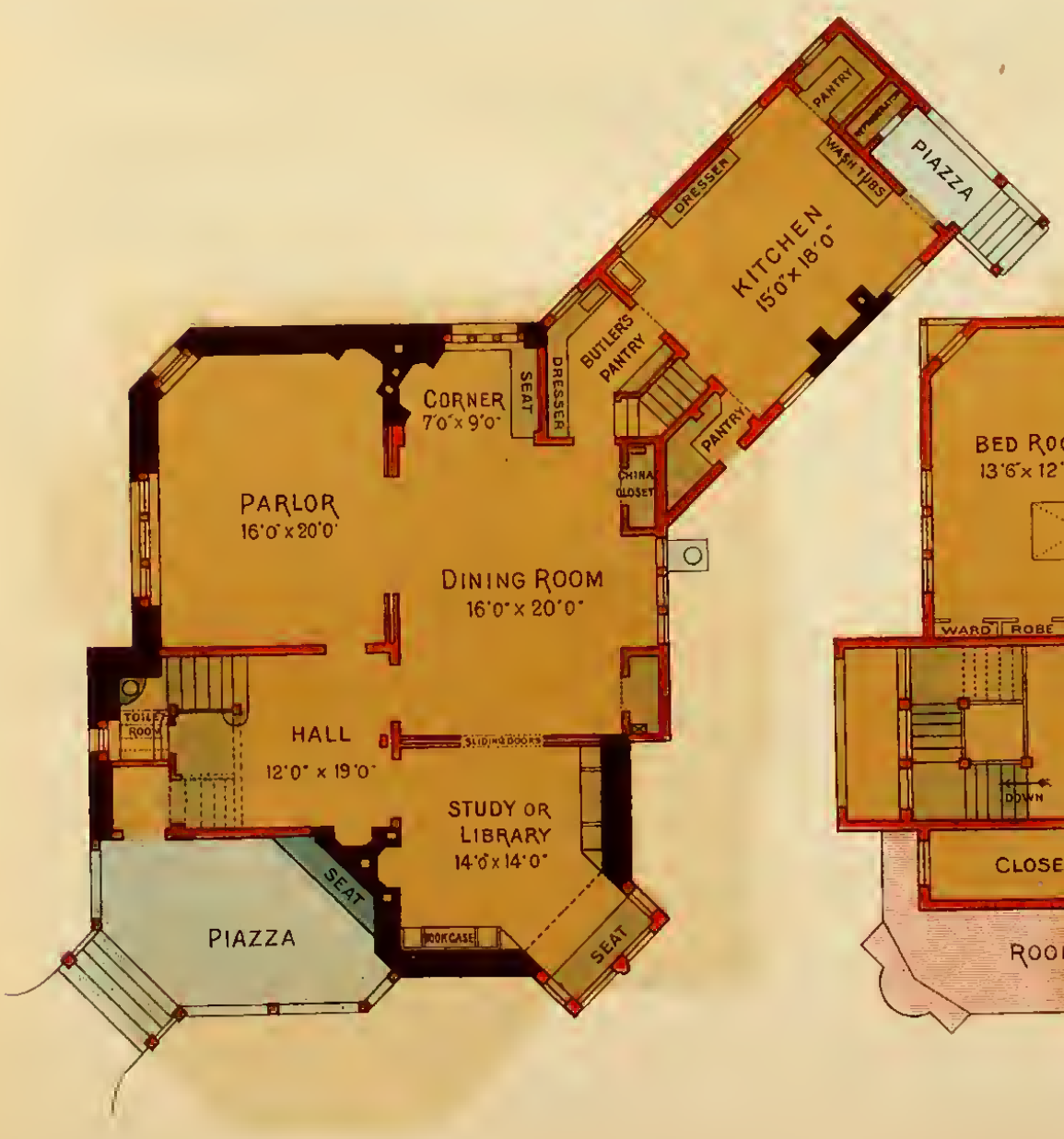
· FIRST FLOOR PLAN ·



· SECOND FLOOR PLAN ·

St. JAMES' RECTORY, FORDHAM, N.Y.

EDWARD A. SARGENT, ARCHITECT, NEW YORK.



·GROUND FLOOR PLAN·

·SECOND FLOOR PLAN·

SCHUMACHER & ETTLINGER N.Y.

A HALL SCREEN.

We give a sketeb of the ball screen in the residence of Marmaduke Tilden, Esq., by William H. Beers, architect, New York.

Weathering Stone.

In ordinary conversation, stone is very generally taken as an admitted type of extreme hardness and the utmost durability. It is tbis opinion which finds vent in the ordinary phrase of comparison that a certain thing is "as hard as a stone."

But this popular view of the qualities of stone is a singularly erroneous one.

True, there are stones which are bard; but tben, again, there are stones which are very soft.

It is also, doubtless, true that tbere are stones which are very durable; but it is no less an incontestable fact that there are stones which are very perishable.

The hardness and durability of a given stone depend upon several causes. Among these may he specified its chemical composition, its structure, and whether it has been brought to its present state mainly by igneous or by hydrous agencies.

The question of the relative hardness of building stones only affects the architect or builder as regards the greater or less quantity of labor required to work tbem or to bring them to certain forms.

The much more important question of durability not only affects the architect and builder, but the patrons who employ them; and, yet more, the whole of posterity, whose pride and rejoicing in a noble edifice, or whose regret and vexation over a crumbling ruin, will depend in an immense degree on the judicious selection of the material employed in building it.

In certain favored regions the air is so pure and dry that the architect has no cause for anxiety about the matter. He literally has no need to "take thought for tbe morrow," as far as his building is concerned, let him employ wbatsoever materials he will in erecting it.

In tbe splendid atmospbere of the valley of the Nile, not only will any description of stone remain unchanged and uninjured through centuries, but even the vividly tinted painting with which the ancient Egyptians covered the walls of palace, of temple, of tomb, has come down to us for thousands of years untarnished and uninjured.

The climate of Greece is similarly propitious to the builder.

About 2,300 years ago (B.C. 440), Iktinas erected on the Acropolis of Athens that magnificent temple of the Virgin Goddess Athene wbich we term tbe Parthenon, and Pheidias, tbe greatest of the sculptors of Hellas, enriched it with tbose immortal works of his chisel which are forever famous. Both temples and statues were formed of pure white marble from the famous quarries of Pentelicus. The hand of time was powerless to deface or injure tbe imperishable stone, although the cannon of the Venetian and the gunpowder of the Moslem brought tbe splendid fane to ruin, a ruin afterward assisted by the pillage of more civilized men. (For although we, as a nation, have benefited by the pillage, still truth must be spoken.) But no detail either of the ruin whicb towers above Athens or of the scattered fragments which enrich the courts of our national museum has lost one iota of its freshness, sharpness, and delicacy from the touch of Time's "effacing finger." This is a point which every one may verify for himself or herself.

This Pentelic marble, thus found so enduring, is, of course, a limestone. Let us now see how a limestone fares in the corroding air of our "misty isle." It is, of course, true that we have no native limestone equal to Pentelic marble, either in hardness or closeness of texture; but if we had, they could not withstand a climate before which even granite succumbs.

"Limestones and dolomites," says Mr. E. Hull, F.R.S., "are especially subject to disintegration from tbe influence of rain charged with acid, and this country presents numerous unhappy examples of its effects. Of these, perhaps, the cases of St. Mary Redcliffe Church, in Bristol, the new Houses of Parliament, and Henry VII.'s Chapel in Westminster Abbey are the most instructive examples—the first built of oolitic limestone, the second of dolomite, and the third of Caen stone, a white limestone of Normandy, of Jurassic age. Even the portions of this exquisitely beautiful structure restored with Bath oolite about a quarter of a century ago have given way before the influence of an atmosphere charged with smoke and dripping with moisture most of the time.

"For such climates, therefore, limestones, especially soft, granular, and porous kinds, should as far as possible be avoided, and even sandstones which contain a notable percentage of calcareous matter in the form of cement. The best kinds of building stones for smoky and wet climates are siliceous sandstones, formed of grains of quartz cemented together by a siliceous or feldspathic paste. In Great Britain such rocks are largely distributed among the lower carboniferous formation of Scotland, the North of England, and Wales, the materials of which they are composed being derived from the disintegrated gneissose and granitic rocks which formed the land of the period. Such rocks are almost indestructible, and have been used with good results in some of the large manufacturing and smoky towns and cities of those districts where they occur. Being destitute of carbonate of lime or magnesia, they are not exposed to the corroding action of the acids which pervade the air."

While perfectly agreeing with the views of Mr. Hull, as expressed in the foregoing extract, we do not consider it at all likely that architects and builders will readily relinquish their *penchant* for the limestones—a predilection which their easy workability and good appearance render not at all unreasonable.

The "weathering" of stone, as the influence of climate upon it is called, is a matter much studied by modern builders, and justly so, because the selection of the best possible material for any edifice is clearly a matter of paramount importance.

Many building stones of the class to which we have referred consist chiefly of carbonate of lime and carbonate of magnesia in about equal proportions. It is the sulphuric acid found in the rain water which descends on urban districts which so seriously affects stones of this description. Much, however, depends upon the *structure* of the stone itself. If this be crystalline, the stone, despite its chemical composition, may be good and durable; if, on the contrary, it be "amorphous"—that is, not having any determinate form of its constituent atoms—it very readily suffers. But in a large city, where the atmosphere is inevitably largely impregnated with acid vapors, even the crystalline limestone cannot but suffer.

The action of the acid on a magnesian limestone, such as that of which we are speaking, is that the sulphuric acid displaces the carbonic acid of the carbonate of lime, and forms with the magnesia a sulphate which is soluble in water, whence results the mischief.

In illustration of this fact, we may remark that it has lately been proved that in the atmosphere of a large town, with abundant coal smoke and rain, inscriptions in marble become illegible in half a century.

It is thus apparent that a certain stone may appear hard and durable enough in a pure country atmosphere which would yet be of no value in a large city. The carbonic, sulphuric, nitric, and hydrochloric acids of the latter *locale* all conspire to rot the stone.

The architect or architectural student, therefore, desirous of estimating the value of any particular stone for city use has many things to take into account in making his appraisement. In the first place, he has to discover the chemical constitution of his specimen, which has to be accomplished in the ordinary way of chemical analysis. Then, seeing how important is the part played by the structure, he has to decide by ocular inspection, aided, if necessary, by the microscope, whether the rock be crystalline or amorphous, bearing in mind that in the latter case the risk of its succumbing to the deleterious atmospheric influences of a town are considerably increased.

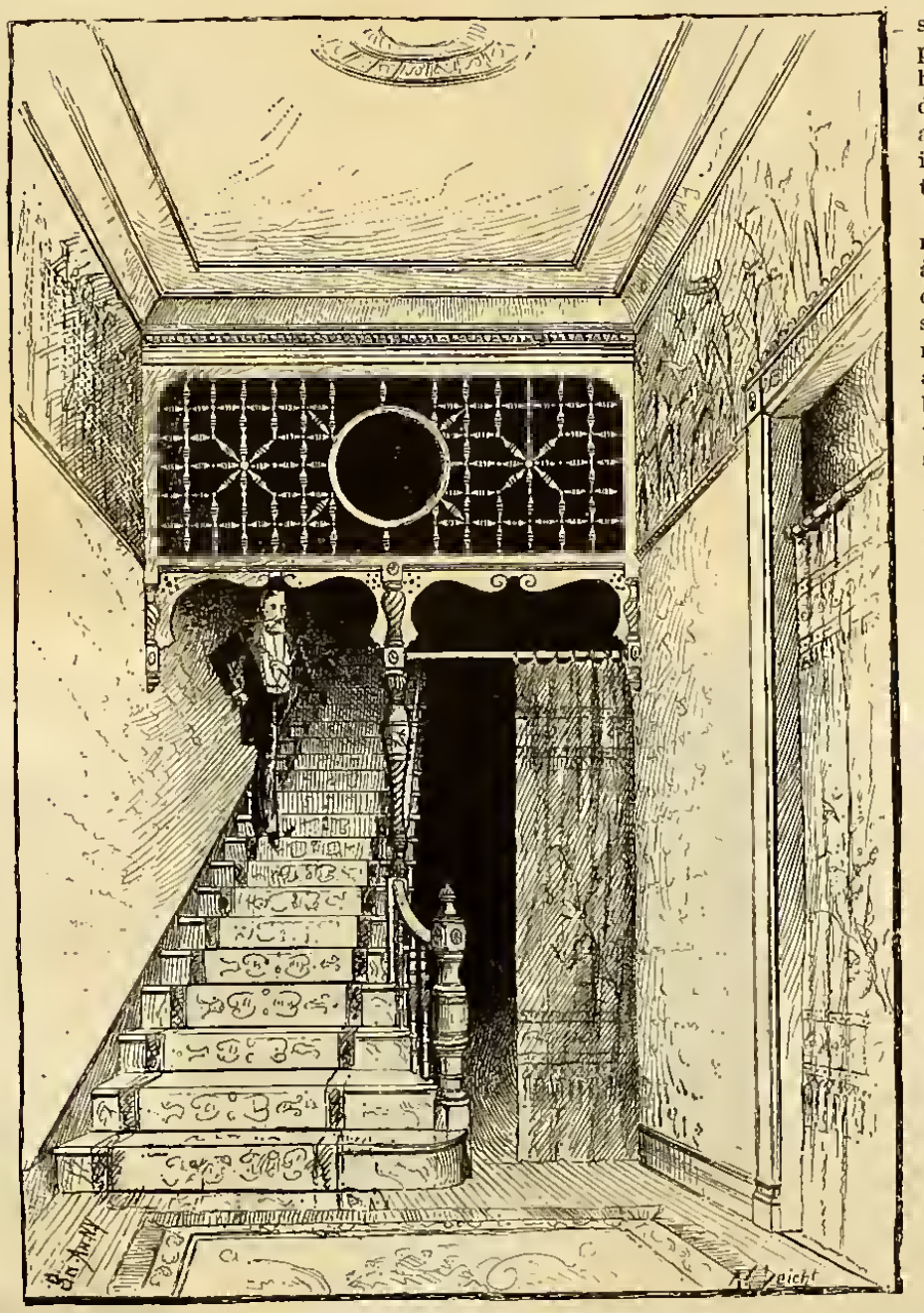
Various plans have been tried to discover the resisting power of stone in this regard, none of which, however, can be pronounced very successful.

Solutions of very weak hydrochloric or sulphuric acid have been made, in which pieces of the stone under examination have been placed and left for several days. It is said that the action of these acids on the stone shows roughly whether it is capable of being durable or not in the atmosphere of a large town.

The purity of a limestone may be roughly estimated by chipping a piece off a block, and putting it into weak hydrochloric acid. If much impurity is present, it will be shown by an insoluble residue which will remain behind. The acid may attack some of the impurities, but the proportion of non-calcareous matter so attacked is usually extremely small.

Mr. C. H. Smith proposed a test in which several damp pieces of the stone might be placed in a glass about one-third full of water. After a lapse of about half an hour they should be agitated, and if the water then has a milky appearance it shows that the stone is not thoroughly crystalline, but contains some earthy matter. If the water is very milky, it shows that the stone is not very durable.

These considerations will, we think, prove that the proverb "Hard as stone" is deceptive, at any rate in an architectural sense.—*Builders' Reporter.*



DESIGN FOR A HALL SCREEN.

The Coloring of Metals.

According to the *Illustrirte Zeitung fur Blechindustrie*, a grayish black coloring on copper may be obtained by placing the object for treatment, after being well cleansed, in a weak solution of liver of sulphur. When a caustic effect has, after a short time, been produced, the object is rinsed, slightly heated, and brushed with a stiff brush. This coating is said to be very durable.

A blackish brown bronzing can be applied to vases, figures, busts, etc., cast from zinc, by the application of a solution of sulphate of copper. If the projecting portions are then well rubbed with a woolen rag, they assume a coppery red brilliancy, which increases the resemblance to genuine bronze. A solution of verdigris in vinegar also produces an effective bronzing.

Brass may be colored black by repeatedly coating the cleansed metal with a moderately warm solution of nitrate of copper. Heating over a charcoal fire follows. Finally, the tone is heightened by rubbing with olive oil.

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HOW TO MAKE PAPER ROSES.

Of all artificial flowers, the easiest made, the cheapest, and I may add, in my opinion, much the prettiest, are paper flowers. I append a few plain directions with regard to making them, which, if followed out carefully, will give excellent results. To make a rose like Fig. 8, first get a piece of tissue paper and cut it square—3½ to 7 inches square, according to the size of flower you wish to produce—bring the opposite corners of the paper together (Fig. 1), folding it into a triangular shape; redouble it twice again in the same way and double it in the shape of Fig. 2; cut the top round (see Fig. 3), then cut it in the center a little more than half way down, as you can see in Fig. 4; open it out and make a hole in the center (Fig. 5). To make a complete rose, you must have eight pieces of paper like Fig. 5. Take a piece of cloth or wool and wind it around a thin piece of wire for the stem, and cover it with a piece of green or yellow paper (Fig. 6), and put the wire through the hole in the center of Fig. 5; then, after you have placed the stem through the center of Fig. 5, you must proceed to turn the petals or parts down, first taking one of the parts or petals, and then the one right opposite, and so on until you have turned them all down. Press the edges lightly, then take a pin and lift them one by one, until you have lifted every one of them up. Take a piece of sealing or bees wax, and place it around the stem just under the pieces, so as to stop them from falling off, and take a piece of paper and paste it neatly over the wax, and cover the stem with a piece of green paper. To make the rose like Fig. 10, provide a long, narrow piece of paper, and fold it so as to form nine equal parts (Fig. 9); cut them about half way down at the beginning of each part, and curl the upper corners by taking a pair of scissors and drawing the paper between your thumb and the blade of the

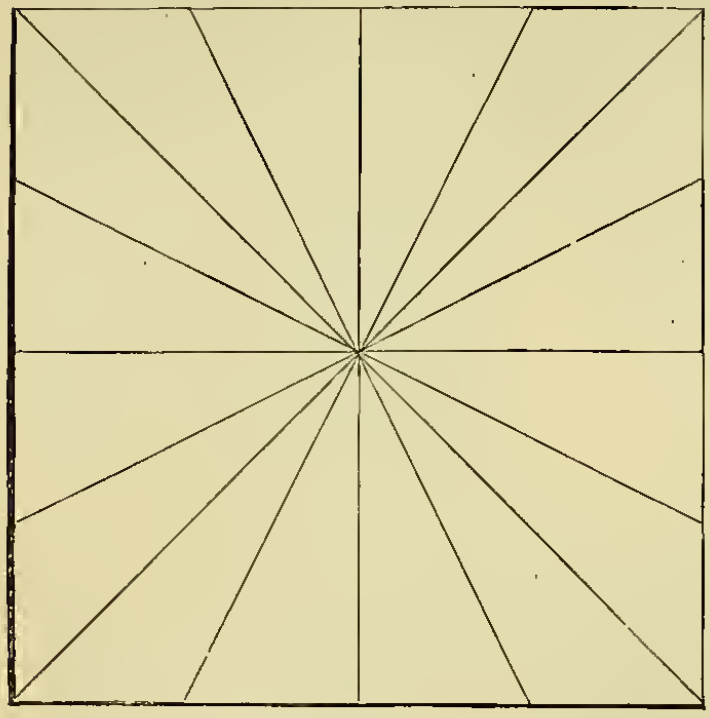


Fig. 1

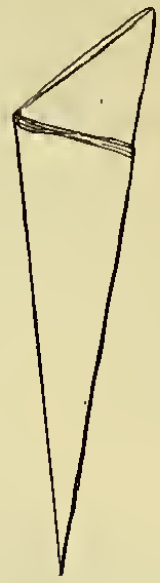


Fig. 2.

Fig. 3.

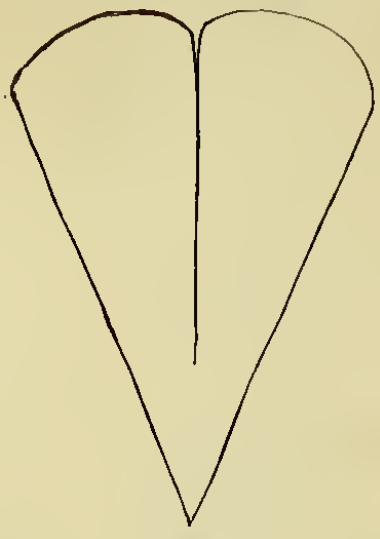


Fig. 4.

Fig. 6.

Fig. 9.

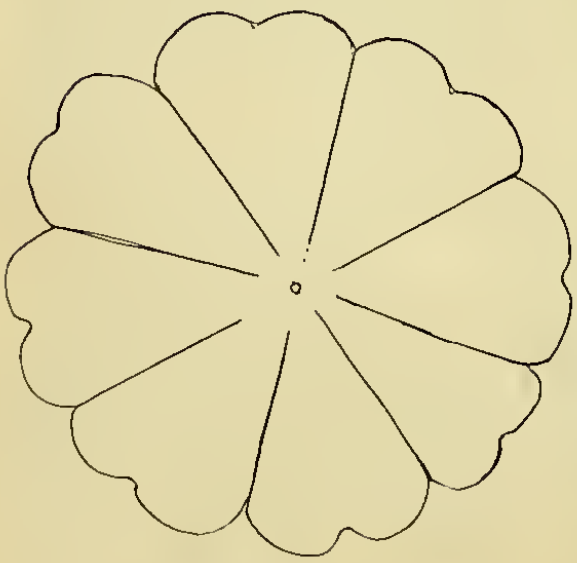


Fig. 5.

No 8

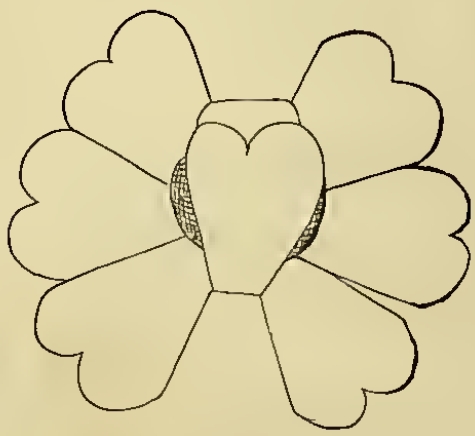


Fig. 7.

Fig. 10

HOW TO MAKE PAPER ROSES.

scissors. After you have done this, proceed to fold it. In folding it, you first wrap it twice around your first finger, then place your second finger close to your first, and wrap it around both fingers three times. Placing your third finger close to your second finger, you wrap the remainder of the paper around all three fingers, then twist it at the lower end and fasten a stem to it by twisting a fine wire around it, or by a small piece of beeswax, and then place the leaves on the stems as follows: To make the leaves, get a piece of green paper and cut it out in the shape of a rose leaf, or, if you have a book with illustrations of rose leaves in it, you can just place the tissue paper over the illustration and trace it with a pen or lead pencil. Cut it out and leave a narrow strip at the lower end of the leaf, so as to fasten it to the stem; get a piece of thin wire, the same as you did for the rose. For the stem, first fasten the leaves to it by twisting the narrow slip at the lower end of the leaf around it, and so on until you have fixed all the leaves in their proper places; then take another thin slip of tissue paper and twist it around the stem, commencing at the upper end, and when you have covered it all over, take a little paste or mucilage and fasten the lower end securely to the wire. A very nice parlor ornament can be made by taking a fan and fixing a bunch of these flowers to it. These flowers look much more natural than the wax flowers, and are more decorative for ornaments.

OLIVER NUGENT.

TWO DWELLINGS OF MODERATE COST.

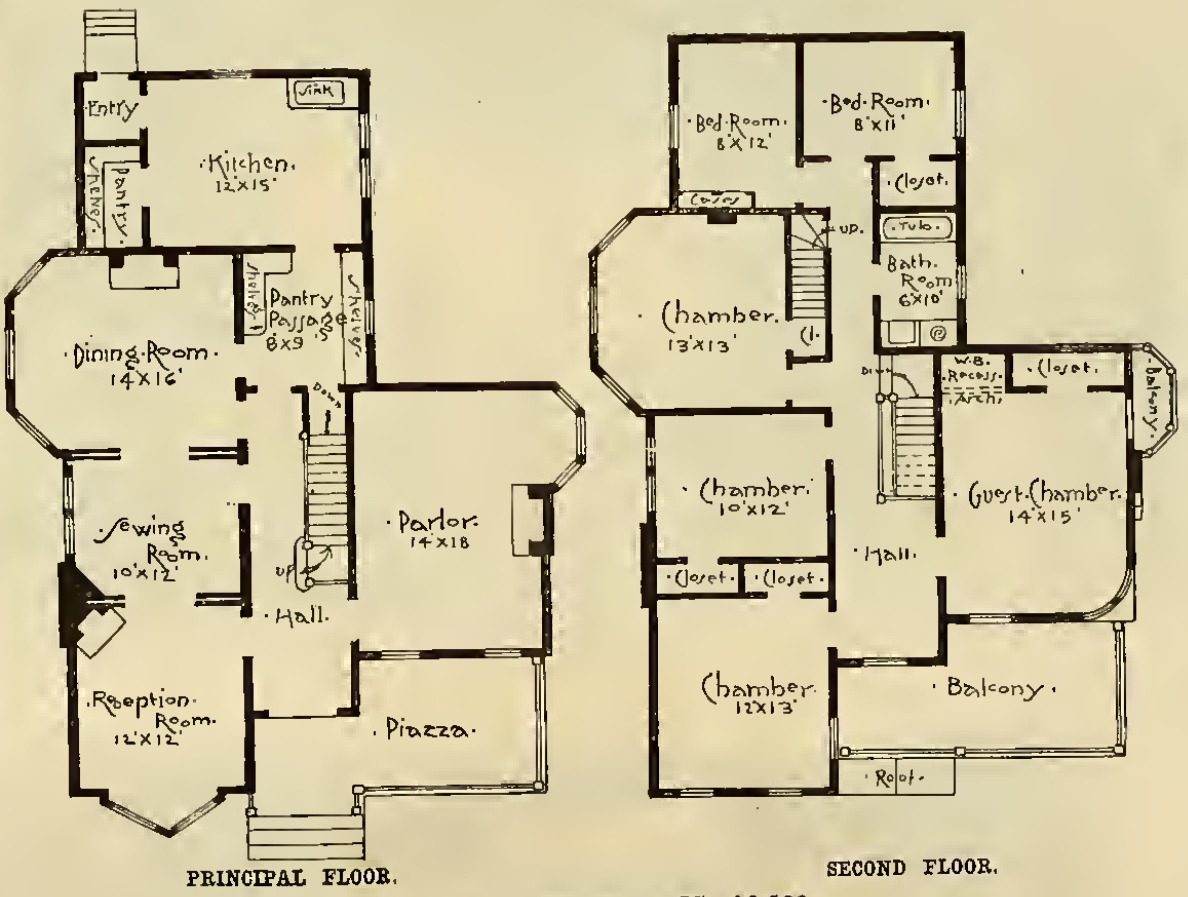
The cost of a house greatly depends upon the interior finish, so that mere size or contents of a certain number of rooms indicates little as to the cost. For instance, the house shown in the upper drawing, though the cost as erected was $3,500, might probably be built for $3,000 if a simple finish were adopted, and twice that sum could be spent without difficulty if more elaborate details of interior finish and decoration were used. The size of the house is quite moderate, but is what is, perhaps, more in demand than any other.

The materials used in construction were of first class quality, and, perhaps, rather better than is usually found in houses of the size. A cellar is provided, and hard wood trim is employed in the parlor and staircase—a material item of expense which could be easily lessened in adopting the design. The exterior of the house is shingled on roof and second floor, and is clapboarded below.

Our lower engraving shows a comfortable looking little residence, which has been built at Little Falls, N. Y., from the designs of Mr. A. W. Fuller, architect, of Albany, N. Y. It cost $4,500, and is a very satisfactory design, with a certain freshness in treatment that is quite pleasing. The first story is clapboarded, and the second story and roof are shingled. There is one finished room in the attic, and a dry cellar below. The trim is pine, with hard wood in the principal rooms, and a careful system of heating and ventilation has been effected throughout the building.

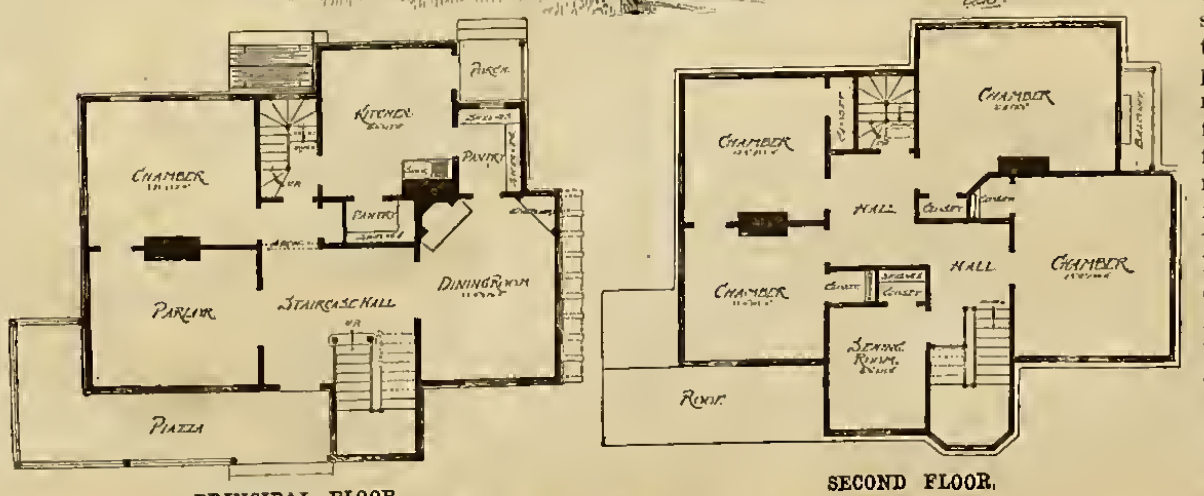
The comfort and utility of a house depend so much upon the arrangement and relative position of the rooms that the success of a design in execution may almost be said to depend upon the manner in which the planning is executed. Unfortunately, this fact is often overlooked, and essential details of the plan are sacrificed for features of the elevation. It is quite common, for instance, to find the kitchen planned in such a manner as to place it in an out of the way position, entailing considerable labor to the servants in going backward and forward, or else it is placed in such a way that the smell of cooking and the noise from the kitchen can be known in anything but a pleasant manner all over the house.

Mr. Fuller has in this design skillfully avoided both errors. He gives a really artistic elevation, with an excellent plan, in which the kitchen is placed in a position convenient for access to the dining room and other parts of the house, and, at the same time, sufficiently isolated to completely prevent any annoyance. The two staircases form another convenience in the same direction. Altogether, the design is a good one.



PRINCIPAL FLOOR. SECOND FLOOR.

A DWELLING COSTING $3,500.



PRINCIPAL FLOOR. SECOND FLOOR.

A DWELLING COSTING $4,500.

Hemlock Lumber.—Southern Furniture Factories.

According to the *Northwestern Lumberman*, hemlock is gradually gaining ground. Every winter, it says, more hemlock is banked, and every year objections to it are possibly a little less pronounced. It would show excellent sense if the people in the West would do away with their prejudice against a wood in favor of which so much can be said. Some day they will certainly be forced to use it extensively. White pine will not last always, and when it shall have largely disappeared, hemlock will, in a measure, take its place. People will use it for dimension, barn and fence boards, and it would not be surprising if for the cheaper class of finishing. —It is to be noticed that in the floating news about Southern industries, frequent mention is made of the starting of furniture factories. As the South grows in population and wealth under the stimulus of revived ambition to rival the North in material prosperity, there will be a rapid increase in the demand for furniture. Fortunately for this industry, there is almost an endless amount of furniture wood in the South, with which to stock factories located in that section much cheaper than Northern manufacturers can procure it. It would not be a matter of surprise to see, within a few years, such a growth of the furniture business in the South as shall become a serious competition with Northern manufacture.

Coverings for Hot Air and Other Pipes.

The manner in which the heat from house furnaces is wasted by radiation from the unprotected pipes in the cellar is within the experience of most persons who have used them. Many a good heater has been condemned and removed for insufficient heating, when the fault has been with the pipes, which, being, perhaps, long and exposed, wasted the heat to a considerable extent. Even in the case of heaters which answer their purpose in giving off sufficient heat to warm the house, there is often a loss of quite a high percentage of the total consumption of fuel from the unprotected pipes.

To prevent such waste of heat, it is only necessary to cover the pipes with an insulating material which will prevent radiation. The same protection may be given to hot pipes where they are located in close proximity to woodwork or other material liable to char or take fire. Mortars, felts, and various other materials have been used as protectors, with more or less success, but the organic matter which they contain has the effect of causing a gradual decomposition, and, moreover, conducts the heat to some extent, and is liable to the ravages of vermin.

Mineral wool is, perhaps, the best material that can be used for the purpose, as it resists the action of fire and water, is practically indestructible, and forms a most effective material for the prevention of the radiation of heat. Messrs. James F. Wood & Co., of Front Street, Wilmington, Del., and 133 North Second Street, Philadelphia, Pa., are the patentees and manufacturers of pipe coverings of this material, having a metal exterior, and being applied to the pipes without the use of paste or cement of any kind. Beyond their great utility as protectors, they have the advantage of being neat and regular in appearance and cleanly in application, while their high qualities of insulating heat render them of especial value in cases where it is required to convey the heat to a great distance, and where it would be almost entirely lost with unprotected pipes

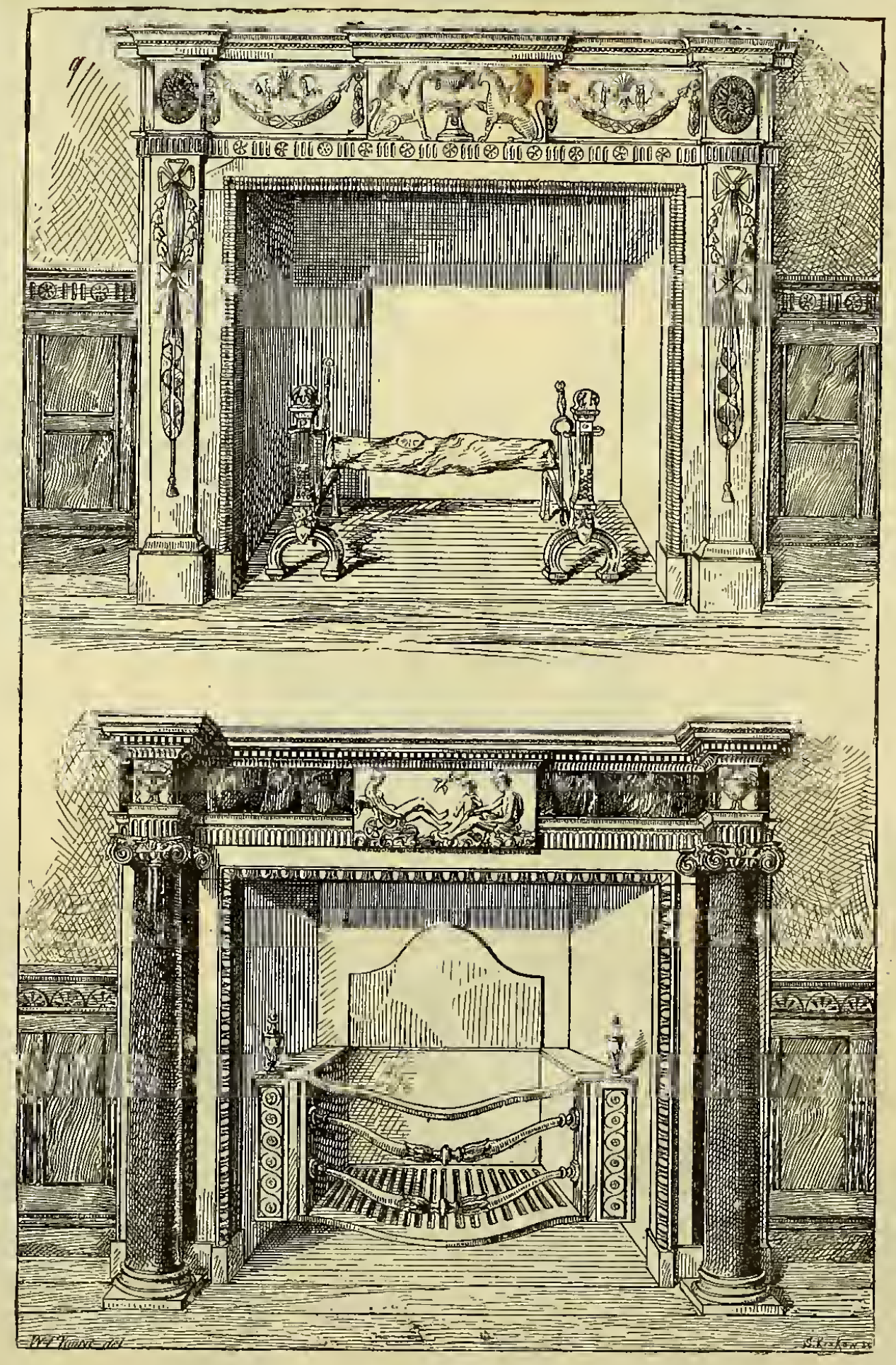
Water pipes located in exposed positions, where they are likely to burst from the water freezing, may be effectually protected by a covering of a good non-conductor of heat, and there are few better protectors for the purpose than those made specially of mineral wool by Messrs. James F. Wood & Co.

Rosewood Stain.

Take half a pound of logwood, boil it with three pints of water till it is of a very dark red, to which add about half an ounce of salt of tartar. When boiling hot, stain your wood with two or three coats, taking care that it is nearly dry between each; then with a stiff, flat brush, such as is used for graining, make streaks with a very deep black stain, which, if carefully executed, will be very near the appearance of dark rosewood. The following is another method: Stain your wood all over with a black stain, and, when dry, with a brush as above dipped in the bright liquid, form real veins in imitation of the grain of rosewood, which will produce, when well managed, a beautiful effect. A handy brush for the purpose of graining may be made by taking a flat brush, such as is used for varnishing, and cutting the sharp points off the hairs, and making the edge irregular. By cutting out a few hairs here and there, the grain may be imitated with great accuracy.

MANTELPIECES FROM OLD DUBLIN.

Our illustration is of two fine old mantelpieces from Dublin. They were made just prior to 1733, for the town house of Viscount Richard Molesworth in that city. They are both classic in design, worked in statuary marble, and are in excellent preservation. The mantel at the top of page is entirely in statuary, and has two pilasters at the sides, carved with wreaths of laurel leaves and drapery; the frieze has also carved swags of laurel, while on the projecting center are winged griffins guarding an urn. The bottom mantel is rather of a richer description, having two Ionic columns of Siena marble, and carved capitals. The frieze is also of Siena excepting the projecting center,



TWO MANTELPIECES.

which is of statuary, and is beautifully carved with figures representing Mars, Venus, and Cupid. The frieze has imitation dentils of Siena and statuary alternately. These mantelpieces have been carefully restored by Mr. Boucneau, of 48 Warren Street, Fitzroy Square, where they can be seen. As will be noticed, they are both in good taste and of noble proportions.—*Building News.*

Wood oil is now being made in Sweden on a very large scale. It is abstracted from the refuse of timber cuttings and from stumps and roots in forest clearings. It cannot be burned in ordinary lamps, on account of the large amount of carbon it contains; but in lamps of special construction it is said to give an excellent light, and to be the cheapest of all illuminants.

The Greatest of Great Walls.

Says a correspondent of the *Milling World*, who has recently been traveling in China: Of course we had to go to the great wall of China. This country abounds in great walls. Her mural defenses were most extensive—walled country, walled cities, walled villages, walled palaces and temples—wall after wall and wall within wall. But the greatest of all is the great wall of China, which crests the mountain range and crosses the gorge from here some forty miles away. Squeezing through the last deep gorge and a deep rift in the solid rock cut out by ages of rolling wheels and tramping feet, we reach the great, frowning, double bastioned gate of stone and hard burned brick—one archway tumbled in. This was the object of our mission, the great wall of China, built two hundred and thirteen years before our era; built of great slabs of well hewn stone, laid in regular courses some twenty feet high and then topped out with large, hard burned bricks, filled in with earth and closely paved on the top with more dark, tawny brick—the ramparts high and thick and castellated for the use of arms. Right and left the great wall sprang far up the mountain side—now straight, now curved, to meet the mountain ridge, turreted each three hundred feet—a frowning mass of masonry. No need to tell you of this wall; the books will tell you how it was built to keep the warlike Tartars out—twenty-five feet high by forty thick, twelve hundred miles long, with room on top for six horses to be driven abreast. Nor need I tell you that for fourteen hundred years it kept those hordes at bay, nor that, in the main, the material used upon it is just as good and firm and strong as when put in place. Twelve hundred miles of this gigantic work built on the rugged, craggy mountain tops, vaulting over gorges, spanning wide streams, netting the river archways with huge hard bars of copper, with double gates, with swinging doors and bars set thick with iron armor—a wonder in the world before which the old time classic seven wonders, all gone now save the great pyramid, were toys. The great pyramid has 85,000,000 cubic feet, the great wall 6,350,000,000 cubic feet. An engineer in Seward's party here some years ago gave it as his opinion that the cost of this wall, figuring labor at the same rate, would more than equal that of all the 100,000 miles of railroad in the United States. The material it contains would build a wall six feet high and two feet thick right straight around the globe. Yet this was done in only twenty years, without a trace of debt or bond. It is the greatest individual labor the world has ever known.

Cross of Wheat and Rye.

A successful attempt at crossing wheat and rye is mentioned in Biedermann's *Centralblatt*. The grain capsules of the wheat were carefully opened, and the stamens removed before they were developed. The pollen from the rye was afterward placed upon the stigmas, and the whole head carefully tied up. The seeds resulting from this process were planted and readily germinated, producing plants that partook of the characters of both parent forms, though with those of the wheat predominating. Some of the ears had long glumes, while others had short ones. The seeds themselves showed a resemblance to rye, but less than to wheat.

A New Cement from Slag.

Selected blast furnace slag is, while it is in the molten condition, run into water, and is thereby reduced to a fine state of subdivision. To this finely divided slag, after it has been carefully ground and screened, a certain proportion of slaked lime, also passed through a fine sieve, is added, and the mixture is thoroughly amalgamated and ground together in an apparatus called by the inventors a "homogenizer"—an appliance consisting of a revolving drum, partly filled with a certain number of metal balls, resembling somewhat in its action the machinery often employed for quartz crushing. Here the lime and the slag particles are acted upon by the continuous blows of the numerous balls, and are crushed to an extremely fine powder. Moreover, their molecules are mechanically brought into the closest possible contact. By this means it is claimed that a "flowery, silky" powder is produced, capable of filling all the interstices in the materials to be aggregated better than the "sharp, sandy, and granular powder" of Portland cement. Indeed, it is asserted that this treatment will improve Portland cement made in the ordinary way. The process of "homogenizing," as compared with simple mixing, effects a vast improvement in the quality of the slag cement, its tensile and compressive strength being thereby almost doubled. This is the entire process of manufacture.

A $1,500 COTTAGE.

BY W. H. HARVEY, ARCHITECT, WORCESTER, MASS.

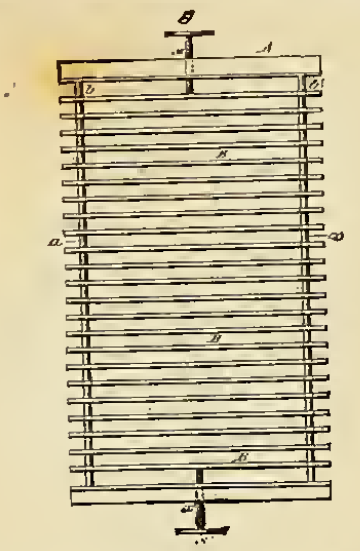
This cottage to cost about $1,500 as estimated by local constructor. The foundation is of stone up to grade line; the walls 20 in. thick, laid dry, and neatly pointed with mortar. The underpinning above grade of good, hard-burned brick, laid in lime and cement mortar, colored red. The chimney of round, hard-burned whole brick, laid in good mortar. The entire first and second stories lathed and plastered one coat, finished with a green skim. The outside finish of best second clear pine. Clapboards of sound spruce, and shingles of clear cedar. The gutters and conductors of cypress. The floors of sound local pine. The inside finish of well seasoned whitewood. Casings for doors and windows 4½ in., reeded with corner blocks. Bare plain beveled 8 in. wide stairs of whitewood; hand-rail of same, placed on iron brackets. All interior doors stock made, 2 ft. 6 in. by 6 ft. 6 in. by 1⅜ in. thick, with beveled rails and stiles and raised panels. All of exterior doors as per detail, with upper panels of stained glass.

All of the exterior to be painted two coats. All of the interior standing finish to be stained and varnished. Floors in kitchen, pantry, bath room, and closets painted. The plumbing comprises bath tub and closet fixtures in bath-room, cast iron sink in kitchen, and the necessary waste pipes and traps, etc., plumbed for cold water. The height of ceilings is: In cellar, 7 ft. 6 in.; first story, 8 ft. 9 in.; second story, 8 ft.; attic, 9 ft. to ridge. Attic not finished.

APPARATUS FOR PAINTING SHINGLES.

BY CLIFFORD I. MILLARD, OF BURLINGTON, IOWA.

The shingles to be painted are arranged between the bars, B B, so that their thinner end will reach about one or two inches above the bars. The rest of the shingles



are below the cross bars, B B. When the apparatus is thus filled with shingles, the cross bars, B B, are, by means of screws, S and S', pressed toward the center of the frame, A, until the shingles heretofore arranged between the cross bars are firmly held between the bars. Now the frame is ready to be moved to any suitable place, where the lower ends of the shingles are dipped to any desired depth into a vessel filled with paint or any other suitable material, and after this is done the apparatus, with the shingles, is put aside to dry. This dipping process may be repeated as often as desired. When the shingles are thus painted, the hold of the screws, S and S', upon the cross bars, B B, is relaxed, and the shingles drop from between the bars, and are now ready to be packed.

Errors in Planning Houses.

To the Editor of the Scientific American:

Please allow me space for a few words concerning the mistakes made in planning dwelling houses, in the location of plumbing, such as bath rooms, water closet, etc. I have before me several copies of your ARCHITECTS' AND BUILDERS' EDITION, and find the evil in several of the plans therein published, which give the plumber no chance to make the proper connections with water and waste pipes. Nine-tenths of the architects do not give a thought to plumbing in their plans, but locate it in any out of the way place, which makes it impossible for the plumber to do good work; and if the connections are not first-class, or there is a leak in any joint, the fault is put on the plumber, but not on the architect, to whom it rightly belongs. This necessarily incurs much more pipe and labor than it would if it was over the kitchen, which it should be. My theory is to plan a house so as to have the bath room, if there is one, over the kitchen, near the chimney, so that direct connection could be made with tank from which the hot water is taken, and also to place the sink in the kitchen in such a position as to have waste pipes from bath room and water closet to connect in the cellar. This would give the plumber a chance to get at his work and do a good job, and avoid the necessity of having a plumber running to the house every two or three months, which incurs expense as well as annoyance.

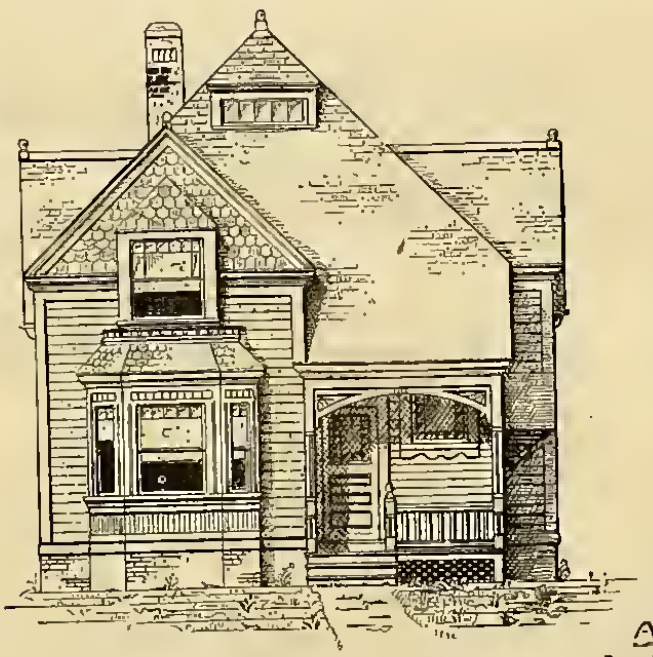
N. H. DECKER.

Newburg, N. Y.

Laundry Hints.

A spoonful of oxgall to a gallon of water will set the colors of almost any goods soaked in it previous to washing. A teacup of lye in a pail of water will improve the color of black goods. Napkins should lie in lye before being washed; it sets the color. A strong tea of common hay will preserve the color of French linen. Vinegar in the rinsing water for the pink or green calicoes will brighten them; soda answers the same end for both purple and blue. To bleach cotton cloth, take one large spoonful of sal soda and one pound of chloride of lime for thirty yards; dissolve in clean soft water; rinse the cloth thoroughly in cold soft water, so that it may not rot. This amount of cloth may be bleached in fourteen or fifteen minutes.

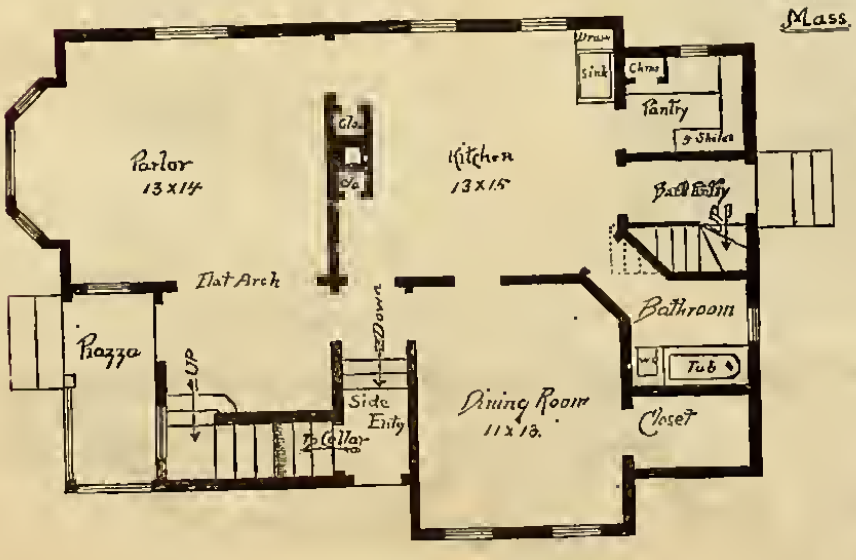
JAMAICA is said to contain about 500 species of ferns, or one-sixth of the ferns of the whole world.



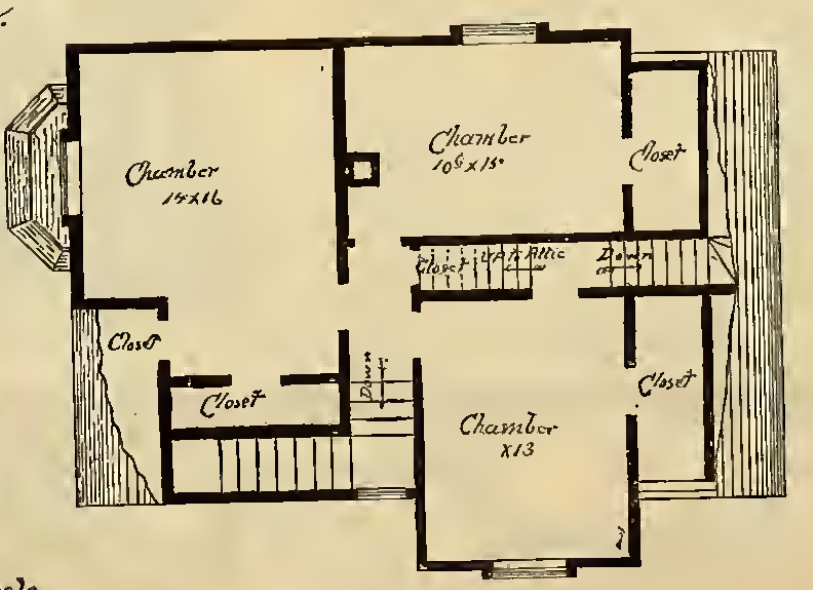
FRONT.

SIDE.

A $1500 COTTAGE.
W.H. Harvey Arct
Worcester
Mass.



FIRST FLOOR.



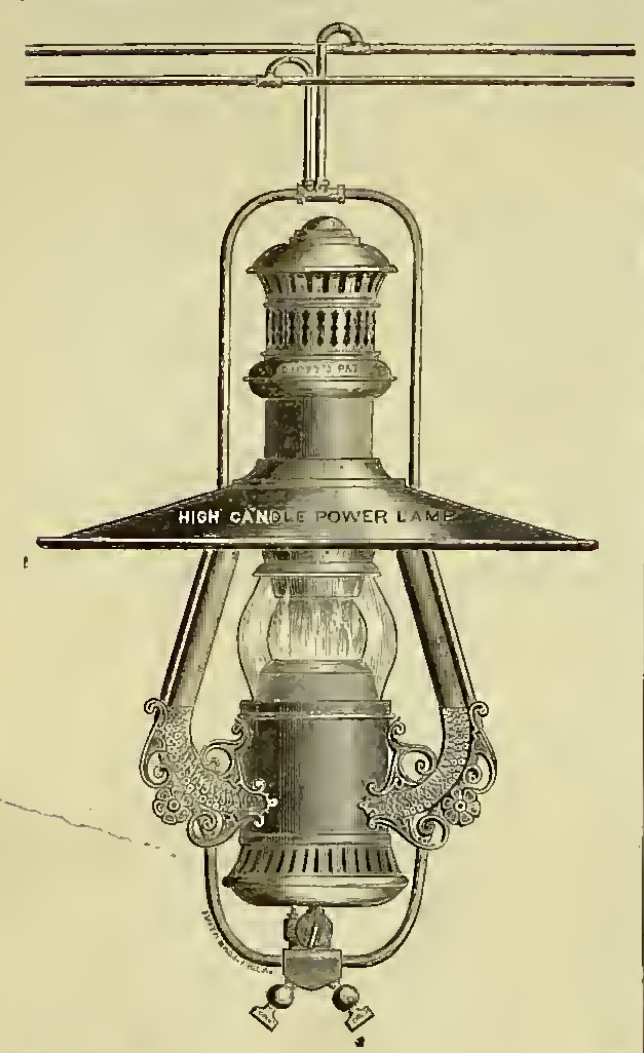
SECOND FLOOR.

Scale.
6' 10' 15'

A COTTAGE OF MODERATE COST—$1,500.

GAS LAMPS FOR LIGHTING LARGE SPACES.

The competition between gas and electricity has proved of great advantage to the public, for while in most cases electricity for lighting purposes costs more than gas, the increasing use of electricity has stimulated inventors and manufacturers to the making of many improvements in the appliances for and methods of burning gas, whereby the cost is lowered and greater efficiency is obtained. An example of the means by which gas is thus more efficiently used for the lighting of large spaces is afforded in the illustration herewith of a high candle power lamp, such as made by the Standard Gas Lamp Co., of Philadelphia. By the use of such lamps as these, of 40 candle power and over, the place of the electric arc lamp is supplied, and a light is given which does not cast those heavy shadows which render a gas light so often necessary in addition to electricity. Then, too, the improved burners which are used with these high candle power gas lamps result in a great comparative saving of gas, which is thus more perfectly burned to give the maximum quantity of light possible. In connection with this method of furnishing light, the company use Dyott's patent system of instantaneous lighting and extinguishing gas lights, without electricity, by which one or one hundred burners can be instantly lighted or extinguished by turning one stopcock. This, of itself, renders it possible to readily save a large amount of gas; and where the system is used in railroad depots, where the full light is only required for a short time, on the arrival and departure of trains, the saving thus effected has been enormous. It is this fact, in connection with the economy of burning the gas in these high candle power lamps, which has led the Pennsylvania Railroad Company to adopt the lamps and system of lighting of the Standard Gas Lamp Company in their depots and warehouses.



THE NARROWEST HOUSES IN NEW YORK.

JOHN M. PAGE.

New York has scores of noteworthy buildings laying claim upon public attention because either of their architectural pretensions or their size. It is doubtful, however, if among them all there is any more curious than the one shown in the cut.

It is curious in being the narrowest building in New York. It covers a lot 102 ft. deep and only 5 ft. wide, and comprises two private dwellings. Of even width from front to rear, except for its bay windows, it may be safely pronounced the narrowest building in New York.

As one would naturally suppose, such houses must owe their existence to some extraordinary cause; and the story of the origin of this pair is of interest.

When Lexington Avenue was first projected, it was the intention of the city authorities that it should extend no further north than to the southern side of Hamilton Park. This park was one of the remnants of the old Jones' Wood, and was projected to cover a large square bounded by Third and Fourth Avenues, Sixty-sixth and Sixty-ninth Streets. The abandonment of the idea of devoting this land to the purpose of a public park accounts for its now being the site of such a number of large institution buildings, charitable and educational. After the abandonment of this park, Lexington Avenue was cut through to the end of the island, and many houses and pieces of land were distributed. Among others a certain lot on the northern side of Eighty-second Street, which was almost wholly absorbed, leaving only the strip of 102 ft. by 5 ft., which has since become the site of this uncommon building.

The owner of this strip then tried to buy the adjacent land in Eighty-second Street, a piece 95 ft. by 102 ft. But he and his neighbor could never agree upon the terms. The strip lay idle till the spring of 1882, when the owner of the inside property wished to build. In order that he might have a frontage on the avenue, he began to negotiate for the purchase of the narrow corner strip; but for no consideration would it eccentric owner give it up.

The upshot of these negotiations was that the latter vowed that he would never part with his land, and, moreover, that, worthless as it might appear, he would build on it, and more than one house at that. This presumably absurd threat he carried out to the letter, and with such alacrity that his two houses stood there before his neighbor could enjoy one single day's light through his side windows.

The subjoined plan shows how the lot has been divided crosswise into two equal sections, each 51 ft. by 5 ft. Of course, a really habitable house could not be built within lines so contracted; but from the plan it may also be seen to how great an extent the builder availed himself of the privilege granted by the city of making projections upon the city land, under the name of bay windows. It was solely by making these projections, and thus gaining in places an interior width of 7 ft. 3 in., that anything like a room could be obtained. In this way fully two-thirds of the area of each house is bay window.

The exterior is of red pressed brick of good quality, with white pointings. A white, rough-faced marble is used for the sills and arched lintels of the windows and doors, which are wholly destitute of side trimming. The only windows in the basement, which represents kitchen pantries and coal cellar, are plain round holes two feet in diameter, opening near the ceiling. On the ground and upper floors, the windows are of the most contracted size, and all the same. Those on the ground floor have white wooden shutters, while the others are without any protection but inside blinds.

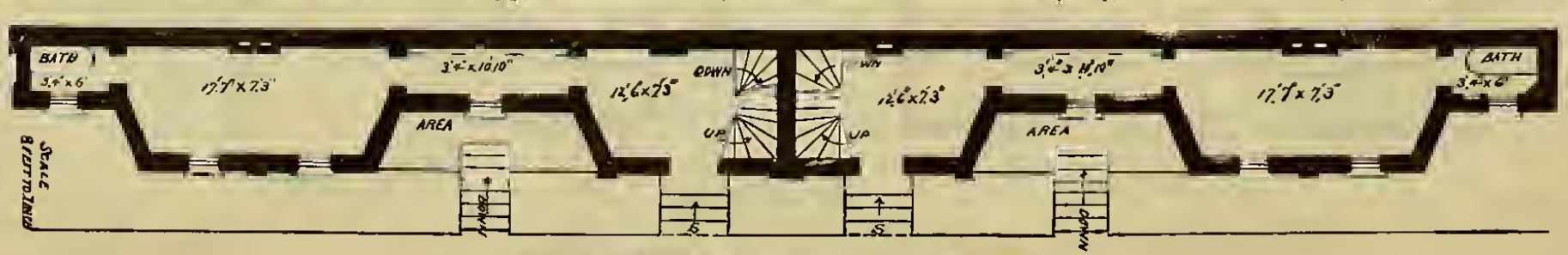
The great disparity between the narrowness of its side and the length of its front, together with the curious combination of building materials, give it an effect which, fortunately, can be seen nowhere else in the city. From the front project three broad bays to a distance of four feet. The middle one of these bays is evenly divided between the two houses, and contains the front doors. It is surmounted by a low gable, about eight feet below whose apex is a large stone forming the cap of a broad pier and bearing the date "1882." This pier and also similar piers in the middle of the side bays are ornamented with a stripe of alternately red and yellow terra cotta tiles. These tiles are the decorative features of the exterior.

The small street door opens into a marble floored hall 12 ft. 6 in. by 7 ft. 3 in. One end of this hall is occupied by the corkscrew stair which winds from ground to roof. Opposite the stair is an arched opening in the brick cross wall (none of the partitions are of wood) into a passageway 3 ft. 4 in. wide, in which for the first time the proper width of the house is encountered.

From the other end of this passage opens the solitary room, a space 17 ft. 7 in. by 7 ft. 3 in., or about the size of the average hall bedroom. From the extreme end of this opens a bathroom 3 ft. 4 in. by 6 ft. The heights of ceilings and interior finish is the same on all the living floors, as is also the plan; so that the uses of the rooms are left wholly to the discretion of the occupants. The basement interior is lined throughout with expensive enameled white brick, making it the best finished floor of the house.

There are no fireplaces on any of the floors, the only means of heating being by having a stove in every room. This difficulty of heating is said to be the only objection to the houses as residences.

In this way was the curious determination spoken of carried out, and better yet: ever since they were built, the wealthy owner has lived in the one on the corner.



THE NARROWEST HOUSE IN NEW YORK.

Anti-Magnetic Shields for Watches.

The Giles patent shield for protecting watches from magnetic and electrical influences is made of gold, pure copper, and fine decarbonized steel. The watch movement is surrounded by a compact shield of this combination, so made as not noticeably to increase the size of the case, the principle of the combination and the design in its arrangement being that one of the elements is one of the greatest absorbents of the magnetic current known; another, one of the best conductors; and that the third, offering but little resistance, acts as a diffusing agent, whereby any magnetic influences from currents, or impulses from electrical machines, will be absorbed, conducted, and diffused before reaching the watch movement. Unquestionably, there are times when the magnetism of the earth and atmosphere seriously affect the running of watches. Parts of watches, also, frequently become magnetized from influences which the wearers do not suspect, making this one cause among the most difficult with which watchmakers have to deal. The anti-magnetic shield is intended to prevent all the evils flowing from such influences, and is recommended for this purpose by some of our best electricians, as Prof. Elisha Gray, Prof. Anthony of Cornell, and numerous others. The office of the Anti-Magnetic Shield and Watch Case Company is at No. 18 John Street, New York City, and Giles, Bro., & Co., of Chicago, keep a full assortment of watches provided with this improvement.

Spontaneous Combustion of Wood.

Mr. Braidwood, superintendent of the London fire engine establishment, stated before a committee of the House of Lords that by long exposure to heat not much exceeding that of boiling water, timber is brought into such a condition that something like spontaneous combustion takes place, and that it may take eight years for the heat from pipes charged with or used to convey steam, hot water, or heated air, laid among the joists of a floor, or in the heart of a partition, or elsewhere in a building, incased in timber, to induce the condition necessary to the actual ignition of the timber.

A Large Casting.

One of the largest castings for marine engines ever turned out has just been cast at Messrs. J. Black & Co.'s Portobello Foundry, Monkwearmouth, viz., a bed plate, etc., 21 ft. 6 in. by 16 ft., weighing 25 tons. It was moulded and cast complete in 21 working days, and the metal was poured into the mould from three ladles, containing twelve, ten, and nine tons respectively, in one minute and fifty seconds, without a hitch.

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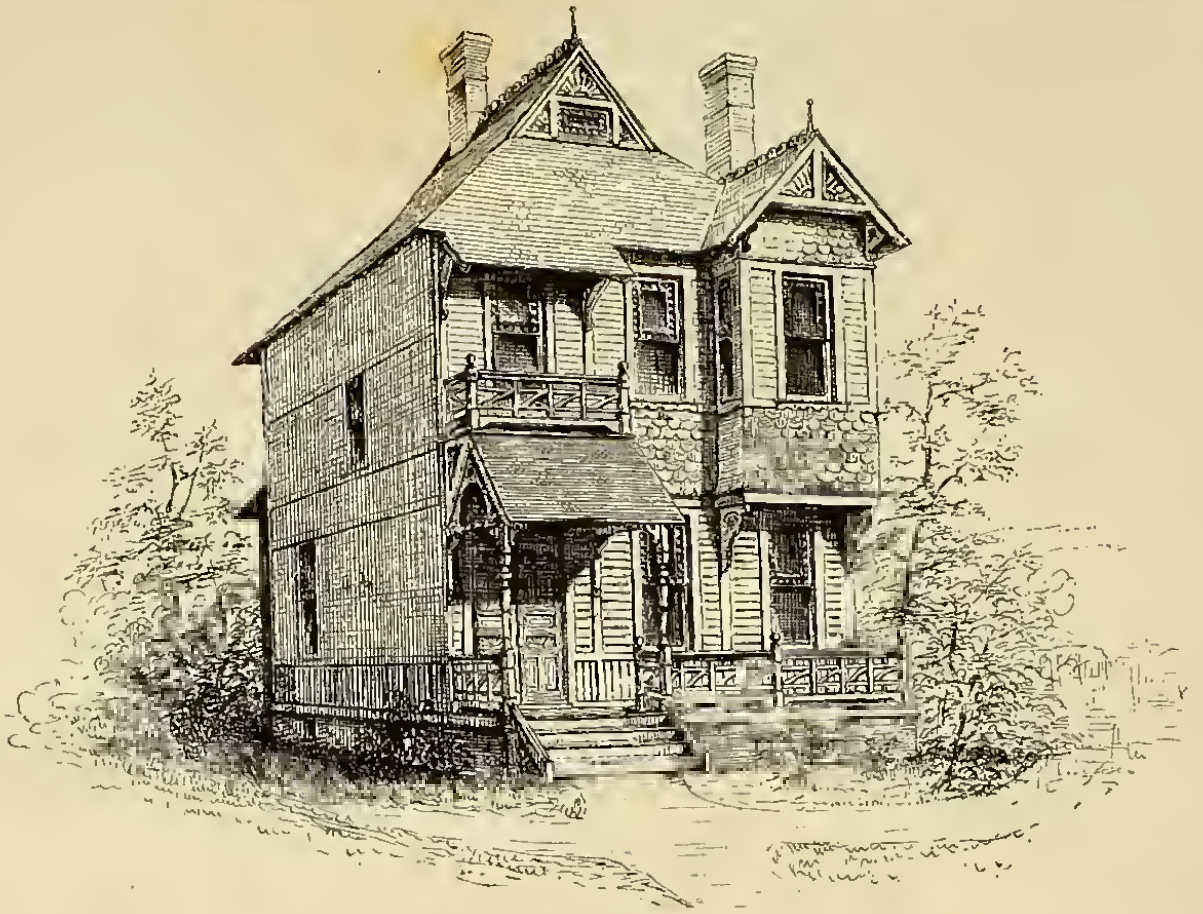

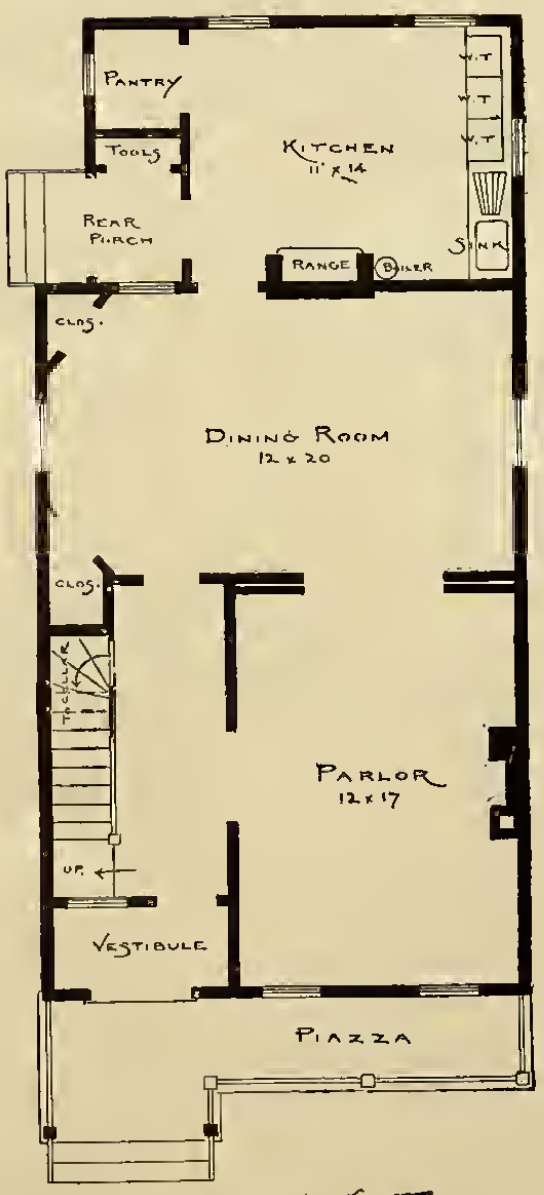

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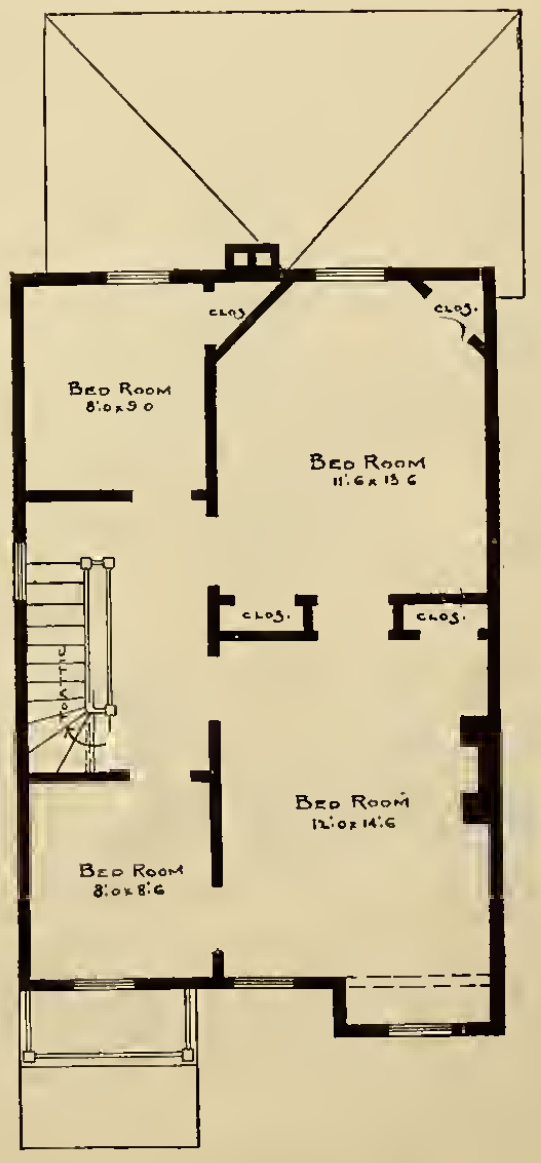

Second Floor.

A $2 600 COTTAGE AT EAST NEW YORK.—CHAS. E. HEBBERD, ARCHITECT, NEW YORK.—[See page 26.]

Scientific American.

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NEW YORK, FEBRUARY, 1887.

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Back Numbers.

At present we are able to supply to new subscribers the back numbers of this journal from its beginning in November, 1885. Each number is accompanied by a sheet of colored plates and a sheet of details.

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THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

In this city, through the munificence of Mr. Willard, a trust fund of $80,000 has been bequeathed to the Metropolitan Museum of Art, for the purpose of establishing an architectural collection. The scheme has been approved by prominent museum authorities, archæologists, architects, and many others whose knowledge and experience qualify them to express an opinion.

Even the best of modern museums, though scientifically planned and connectedly arranged as to sculpture, painting, and the industrial arts, fail to give architecture the space and thought it so richly deserves.

In founding this collection he wished to do all in his power to cultivate and encourage a popular taste for it, to help such students as were unable to secure the advantages of travel, and to elevate the standard of American work by presenting choice selections of the masterpieces of all styles.

He desired the collection to tell a clear and graphic story of the progress of the art, from the earliest period to the time of the Renaissance. No important type was to be slighted; neither was the collection to consist merely of fragmentary bits of detail. It should present all the distinctive styles in historical sequence, and in such manner as to show their inter-relationships and transitions. It should comprise carefully made, good sized models of typical buildings, casts of doorways and other minor architectural features, and a complete collection of casts of applied ornament, sculpture, and architectural detail, sets of photographs, and plain or tinted illustrations and engravings. An effort will be made to form a complete collection of scale models. They must be made to order, are expensive, must be accurately detailed, and time will be required to obtain them.

Chances of acquiring valuable collections of originals are rare, but the collections of casts have a completeness and a unity not found possible in museums of originals. It is not expected that the sum already raised will enable the trustees to make a complete selection of such examples as they wish to obtain, but it is such a long stride in advance of anything heretofore done of such a nature, that it is worthy of a wide and general recognition.

To the general public the collections of art objects in our museums are too often regarded as mere repositories of curious things. To attain their greatest usefulness, and tell the story of their creation, they should become more and more illustrative of the principles they were designed to enunciate, by becoming more closely connected with the courses of study in our academies, colleges, and other seats of learning

The attitude of the general public toward our museums is a reproach to American culture.

In a most interesting manner was told the story of the founding of the American School of Archæology at Athens.

To an architect, Greece is the idyllic land of the past, and her art the perfect expression of the noblest inspirations that ever moved the heart of man. It has been, until lately, the most inaccessible country of civilized Europe. There is no overland route to Athens. Until within a few years, no facilities or opportunities have been afforded for the study of Greek art upon Hellenic soil. Four art schools are now flourishing at Athens, viz., British, German, French, and American.

An effort was made some four or five years ago to establish an American school on Grecian territory, where American students could make a study of history, literature, sculpture, archæology, and architecture.

The director who had charge of the school was at first supported by a yearly contribution of two hundred and fifty dollars from each of the ten leading colleges. This number was augmented to sixteen. An effort, however, has been made to secure $100,000 as a permanent endowment fund. Through the efforts of James Russell Lowell and others, twenty-five thousand of this amount has been subscribed. It is believed that the remainder will be obtained this winter.

The Greek government offered to donate a plot of land to the American school, if the managers of the school would erect a building. The land obtained adjoins the plot of ground given to the British school on the same conditions.

The two schools have similar courses of study. The requirements to enter each are equally severe. The management of the two schools have a good understanding of one another's aims and purposes, and perfect harmony of thought and action prevails. When lists of books, manuscripts, or prints that are wanted are sent on to London for the British school, care is taken that nothing contained in the American school is duplicated, and *vice versa*, so that the meager funds of both institutions shall go as far as possible. The students of either school share alike the advantages of both schools, and, in fact, the arrangement may be said to be on the English university plan, in which the individuality of the schools is kept distinct, yet are so managed that they possess the identity of a common interest. We learn that a fortunate circumstance has happened in connection with the future usefulness of these schools. Mr. Penrose, who is one of the most prominent of British architects, has been sent from London to take charge of the British school. His wisdom and experience will greatly benefit both schools, and will give a new impetus to their work.

In architecture the work of these schools consists in studying, sketching, and measuring the remains of Grecian art wherever it can be found. The explorations now going on at Assos are noted and recorded. Chiefly, the present state of knowledge of Grecian art has been derived from casts and fragments of original pieces, removed from their surroundings to a foreign country, where all the conditions and circumstances are changed. No one, no matter how great his genius, can gather from a fragment under the murky skies of London, for example, that refinement of light and shadow, that mystery of outline, which the Greek artist or sculptor loved to design, and whose effects could be studied only under his own unrivaled sky and atmosphere.

America is not the place to interpret Greek art. In this country traditions have no sacredness, and history is being made, not studied. To the average American, antiquity is a myth, or at the best a creature of the imagination. The student, however, is urged to visit Greece, to let the past perfect art tell its own simple, immortal story: to return, bringing with him something of the spirit which has wrought such masterly work, the admiration and the despair of all the ages.

Among the items of interest discussed in the trustees' report was an account of the preparation of an act to regulate and improve our federal architecture. A committee was appointed to confer with the supervising architect to draft such a bill.

The present unsatisfactory condition of the tariff in connection with the importation of designs, models, casts, photographs, books, etc., was declared to be in abeyance and unsettled.

As we cannot originate the classic designs of the old world, nor manufacture photographs of antique art which we do not and never can possess, it does seem an absurdity to embrace them in our tariff. In such matters protection is exclusion. A better order of things is now upon us. The Fairchild decision in regard to drawing the line between antique and modern art at the beginning of the eighteenth century is a marked step of progress. It is believed, however, that this special decision applied to paintings only; but that it will eventually include works of art of every name or nature, there can be no reasonable doubt.

It has been said of us as a people that we are so determined to have something new at all hazards that the question is not asked, To what epoch does the style belong? but this: Is it new? We take from here and there, and appropriate a noble cornice, adopting some happy Moorish diaper work for the background of a pediment, select a Romanesque archivolt for a Grecian doorway, and in many other ways ransack the storehouses of antiquity to make a heterogeneous mass, and in the virtuous admiration of our own astounding genius, we have learned to call it eclecticism.

This idea of piracy in art matters is not new. When the Romans conquered Greece, they carried away many valuable art treasures, and the artist too; but this action of the Romans has been explained by the admission that they were too practical and busy a people to study art. They saw what they wanted and by the right of might they took it, but must we make the same admission, and he Vandals too?

(To be continued.)

PRESSED WOOD ORNAMENTS.

Will you please answer in your February number of the ARCHITECT AND BUILDER how pressed woodwork ornaments are made, also artificial ornaments?

E. H. SMITH.

Los Angeles, January 12, 1887.

Answer.—Pressed wood ornaments are made in three ways—on end wood, on plastic veneers, and on a composition of veneers and sawdust.

The end wood is turned up to about the general shape desired, and then forced by hydraulic pressure into steel dies.

Plastic veneers are made by laying shavings of the wood to be pressed side by side until the surface wanted is covered, and then gluing to this first layer several other layers running either in the same direction or transversely or at right angles until the requisite thickness is made up. The veneer thus made is kept moist until ready for stamping between a male and female die, the male die being reduced so as to allow the veneer to enter the mould. The first pressure shapes it up, the shape is then covered with another layer and is finished by two or more pressures, the pressure being retained by suitable mechanical appliances until the glue has set. This work is very solid. The third method, for flat work only, is to soften a thin veneer by wet steam,

and to force it into a hot die with sawdust and flour paste, with some suitable contrivance to allow steam to escape from the sawdust and paste. Imitations of very old carving have been very successfully made by branding the wood frequently with a red hot iron matrix. A mould in plaster of the desired shape is given to the iron moulder to reproduce in iron. The iron mould is heated, and pressed against the wood; at each heating and pressure, the charred wood is removed with a wire brush, and in this way the wood is gradually charred and burnt out instead of being cut out.

Artificial wood or sawdust ornaments are generally made of sawdust, glue, and flour paste kneaded into a dough and pressed into hot metallic dies.

USEFUL HINTS RELATING TO HOUSE BUILDING.

In building a house for myself, to cost about $5,000, what are the *special* points which I must watch—points which may be overlooked by the architect or contractor, because, perhaps, not properly in their province, or because the owner should himself know them? I have never yet built a house, and am, in consequence, wholly inexperienced—an easy prey to imposition and mistakes.

The writer having had some experience in building houses as an owner, and paid somewhat dearly for it, proposes in this article, and, perhaps, in others that may follow, to indicate some of the *points* desired.

In the first place, *be most careful in the choice of your lot.* Do not allow the cost per foot to be the most important element in your decision. A *low priced lot* in the beginning may be the *dearest* in the end, that is, if it is chosen simply because it is low in price. Avail yourself as much as possible of the benefit of others' improvements. If there are desirable residences adjacent to the lot of your choice, the value of yours will be assured at the outset. Remember that you are about to put a certain sum of money into an improvement upon whatever lot you select, and that a *badly located* lot will *decrease* the value of this, while, on the contrary, a *good* lot will enhance the value. Many have suffered disappointment, and actual loss, by an error of judgment in this regard. Your choice will make the difference between a good asset and a poor one.

Having chosen well as to this point, see to it in the second place that the lot *can be easily drained.* To this end, it is not necessary that the ground should be *high*, but rather that it have a slope in *some* direction, otherwise, owing to the *soakage* into the ground of the surface water, which ought to *run* off, your cellar may be damp or even wet at times.

A dry cellar is of the utmost importance, and this is one of the ways to secure it. Another point to be considered in your choice should be *the exposure* it would give your house. By this we mean the way it should front. A wise decision here will conduce greatly to the comfort and health of your family. The writer's experience is that the best frontage or facing for a house is *a little west of south.* This more than any other opens up the rooms to the sun in the winter and to the southwesterly breezes in the summer, thus making the house warm, healthy, and cheerful in the former, and cool and delightful in the latter, as the prevailing winds during the summer are from the southwest. At the same time, they carry away *from* the house the odors and heat of the kitchen; and during the winter the living part of the house is protected from the cold northerly blast.

(To be continued.)

THE FARRAGUT CLUB HOUSE.

Our colored plate this month shows the architecturally attractive building of the Farragut Boat Club of Chicago. This club is, as its name indicates, an athletic organization, but, as may be presumed from the picture of its house, is devoted in no small measure to the amenities of social life.. A home so extensive, and even elaborate, would not be required solely for athletic purposes; and still, having gained great prestige and reputation upon the water, this club never loses sight of its "chief object in life," but simply adds to its attractions club features which interest the members during the season when out door sports are out of the question. Organized nearly fifteen years ago, the growth of the club has been slow and legitimate, and the building of the present club house was for the purpose of supplying the actual necessities of the organization, and providing a house which would adequately accommodate the members and befit the honorable rank achieved by the club. The site selected for the house overlooks Lake Michigan from a point near 31st Street, and is in the midst of the best residence district of the city.

The plans were made by Robert Rae, of the firm of Rae & Wheelock, architects, who is also a member of the club. The intention was to provide a house which would combine all the essentials in the way of club rooms, and at the same time furnish an unusual area of balcony and observatory space for the use of members during the summer months, when aquatic sports are in progress on the lake. The site is so commanding that the entire harbor and lake front, and much of the city, can be viewed from the observatory or lantern of the club house. The ground dimensions are 90 by 40 feet, and the building rises to the height of three full stories, and is surmounted by a gabled roof and tower. Opening from the second story there is a loggia of ample dimensions to accommodate nearly one hundred persons, and the front is further broken and ornamented by two or three hooded balconies. The material used is brownstone and pressed brick, while the balcony gables are finished in bronze and slate. The roof is covered with red slate, with copings of galvanized iron. The main entrance is through an archway and loggia paved with Minton tiles, and opens into an entrance hall from which springs a grand stairway in antique oak. An elaborate mantel of the same material occupies one side of this handsome hall, the decorations of which are in Turkey red and bronze. The other apartments on this floor are the grand parlor, library, directors' parlor, card room, billiard room and coat room, all handsomely frescoed, elegantly furnished, and arranged *en suite*, so that they may all be thrown together for reception purposes, or used separately, as occasion may require. The architectural features of this interior include a semicircular niche or "cozy" in the library, an inset "bay" in the parlor, and the novel and elaborate treatment of the entrance hall and grand stairway. This stairway leads to the handsome ball room above. This room, with a twenty foot ceiling, a striking gallery, and a thoroughly equipped stage for amateur theatrical purposes, is frescoed in soft buff tints and bronze, and is one of the most attractive ball rooms in Chicago. Large doors give egress to the main loggia, which in warm weather is thus made pleasantly tributary to the ball room. On the same floor are the ladies' parlor, gymnasium, and superintendent's offices. The floor above is devoted to servants' rooms and to storage.

The spacious basement, eleven feet in the clear, is given up to bowling alleys, pool tables, dressing rooms, baths, steam heating apparatus and other conveniences. The boats of the club are accommodated in a separate house, immediately on the lake shore, and are not carried into the club house, although that building is within a stone's throw of the lake.

The cost of the club house with its furnishings was about $40,000, including the land on which it is built; but owing to the rapid appreciation in the value of the land, and also to the extremely low building contracts that were secured, the property could not now be replaced for anything like the low sum it cost. The present officers of the club, most of whom have been in charge of its business since the inception of this enterprise, are: Lyman B. Glover, President; G. R. Blodgett, Vice-President; Frank M. Staples, Treasurer; S. W. Jackson, Secretary; G. W. McClellan, Captain; W. R. Fowler, Commander; H. C. Avery, Lieutenant; G. B. Jennison, Ensign; and Harrison Kelley, Chairman of the Board of Admission. The membership is about three hundred.

DWELLING AT BABYLON, L. I.

A small house costing only $1,600 is the subject of portion of our colored plate in this issue. It is now in course of erection on ground situated in the town of Babylon, Long Island, New York, the architect being William H. Beers, of the Tribune Building, New York city.

The elevation is of attractive appearance, calculated to prepossess any one in its favor, while the plan, with the somewhat original feature of a room on the upper story, is conducive to comfort and economy of space.

The materials employed in the construction of the building are fully described in the following specifications:

SPECIFICATION

of materials and labor required in the erection and completion of a dwelling house to be built on ground situated in the town of Babylon, Long Island, N. Y., according to plans and specifications, and under the superintendence, of William H. Beers, architect, Tribune Building, New York city.

Drawings, etc.—The contractors will make no alterations from drawings or specifications, but should any error or inconsistency appear in these during the progress of the work, it shall be the duty of the contractors to duly notify the architect, who will make the proper adjustments.

The drawings and specifications are to be used for this building only, and are the property of the architect, and are to be carefully treated and returned to him on completion of the work. The drawings and specifications are to be signed by both owner and contractor, for the purpose of identification.

General Requirements.—The contractor is to furnish all transportation, labor, materials, scaffolding, etc., for performing the work in the best manner. All materials shall be the best of their several kinds, and all work done in a thorough and workmanlike manner, to the true intent and meaning of the following specifications and accompanying drawings, which are intended to include everything requisite and necessary to the proper and entire finishing of the work, notwithstanding every item necessarily involved by the works is not particularly mentioned. All work, when finished, to be delivered up in a perfect and undamaged state.

Any portion of the work done by the contractors of a quality not approved by the architect shall be forthwith removed by and at the expense of the contractor, and replaced by him in a proper and satisfactory manner.

The contractors must do all the necessary cutting and patching, and make good after all mechanics, also clean out building when required by the architect, also cart away all rubbish that may accumulate at any time during the progress of the work and is not required on the premises, but he can put the same in any suitable place, if any such place can be found on the premises.

All masonry as laid to be properly protected from the weather by the mason, and the carpenter must provide suitable protection to all openings to keep out the cold, rain, etc. The carpenter will provide set centers, etc., required by the mason.

Excavations.—Make excavation for cellar the full size of house, as shown on cellar plan, to about the depth of four feet below the line of the present grade, and place the earth in a convenient place for grading.

Grading.—Fill in around and pack the earth against the cellar walls, after the mortar is dry, and grade the excavated earth around to the height of about one foot six inches above the line of old grade, and slope off the ground on all sides of the building as directed.

Footings and Concreting.—Make footings for all walls, piers, posts, chimneys, etc., of concrete, composed of coarse gravel, one part cement and two parts lime, and sharp sand, also concrete the cellar bottom to the depth of four inches, with the upper surface left straight and level.

Brickwork.—Build cellar walls, piers, chimneys, etc., to the heights and thickness as shown on drawings, of good, hard burned brick laid in mortar composed of one part cement, two parts lime, and the necessary quantity of clean, sharp sand, laid true and plumb with flush joints. Build flues in chimney stacks as shown on drawings. Leave all flues clean and smooth, and plaster all chimney stacks on all sides, as they are laid up to the under side of roof. Also build all other brickwork as shown on plans.

LATHING AND PLASTERING.

Lathing.—Lath all walls, partitions, ceilings in first and second stories and ceiling in kitchen with sound lath of full thickness, laid on ¾ of an inch apart and thoroughly nailed, joints broken every eighteen inches. Under no circumstances must lath stop and form a long, straight, vertical joint, nor any lath put on vertically to finish out to corners or angles; nor must there be any lath run through angles and behind studding from one room to another; all to be formed and nailed solid in angles before lathing; should there not be any properly secured, stop and notify carpenter.

Plastering.—All walls, partitions, and ceilings in first and second stories to be finished with best two coat work, to be properly put on, and applied with sufficient force to secure strong clinches; level and float up the brown coat, and make it true at all points. Cover all the brown mortar with a good coat of best white hard finish, composed of finishing lime-putty and plaster of Paris and clean washed white sand; mix in proper proportions, so as to secure a good and workmanlike job; all lathing and plastering to extend clear down to the floor, and all walls to be straight and plumb, and all angles to be sharp and regular; do all the necessary patching after other workmen, and leave everything in a perfect and complete state.

CARPENTER'S WORK.

Timber.—The timber used throughout this building to be of good quality, well seasoned, and free from sap, shakes, large or loose knots or other imperfections impairing its durability and strength. All to be of spruce excepting where otherwise mentioned.

Framing.—Size of timbers: girders in cellar, 6 in. x 9 in. of spruce timber; sills, 4 in. x 8 in., halved and spiked at angles; posts, 4 in x 8 in.; girts, 4 in x 6 in.; plates, 4 in. x 6 in.; braces, 4 in. x 4 in.; floor beams, 2 in x 9 in., placed 16 inches centers; roof rafters, 2 in. x 7 in., placed 20 inches centers; collar beams, 2 in. x 7 in.; studs for filling in outside walls, 2 in x 4 in., of hemlock; partition studs for inside partition, 3 in. x 4 in. and 2 in. x 4 in., as shown, of hemlock; hip and valley rafters, 3 in. x 7 in.; ridge, 2 in. x 9 in.; trimmers and headers, 4 in. x 9 in. Veranda timbers: sills, 4 in. x 6 in.; plate, 3 in. x 4 in.; floor joists, 3 in. x 6 in.; rafters, 3 in. x 6 in., placed over each post and chamfered; purlins, 3 in x 4 in., about 2 ft. 6 in. from centers and chamfered; posts 6 in. square and turned as shown, of white pine; all trimming to veranda to be of white pine.

The frame to be thoroughly braced at angles, posts to be mortised into sill, girts well framed into posts and beams notched on to sill and girts, etc., and all framing to be done in a substantial manner and to the satisfaction of the architect.

Cross Bridging.—Bridge each tier of beams with two rows of cross bridging to each tier except attic, which will have one row, with 1 in. x 2 in. stuff.

Headers and Trimmers.—All headers and trimmers to be 4 in. x 9 in. properly framed together, leaving all openings of sufficient size for the finish of stairs, chimneys, etc., and in no case allow the wood to come within 1½ inches around chimneys; care must be taken in framing, so that important timbers will not require cutting for chimneys, heater pipes, plumbing, etc. Cross furring for first story ceiling of 1 in. x 2 in. stuff.

Exterior Work.

Sheathing.—Cover the whole frame and roof with square-edged hemlock sheathing, free from large loose knots, laid with close joints and thoroughly nailed to frame.

Building Paper.—Cover the sheathing of all outside walls and roofs with best sheathing paper, carefully tacked on and lapped three inches, and neatly fitted around all openings, dormers, gables, etc., in roof. Rosin-sized sheathing paper to be used.

Clapboarding.—Put on best quality of clear, dry white pine clapboards, all laid perfectly even gauge of not over 4 inches: cut close joints against all casings, etc., and all well nailed to every stud, with nails set in for puttying.

Corner Boards.—Casings, bands, etc., to be of the width as shown on drawings and about 1¼ in. thick, and all other trimmings to be as shown on drawings. All this work to be of well seasoned white pine free from large loose knots, etc.

Veranda.—All posts to be turned as shown, rail and brackets, cornice, etc., as shown. The veranda roof to be laid with narrow tongue and grooved stuff headed on one side, laid close and well nailed. All to be of white pine.

Lay the floor with tongue and grooved white pine flooring about 4½ in. wide, blind nailed and laid close. Construct steps as shown, 1¼ in. tread, ⅞ in. rise, to have cove under nosings, etc. Case under veranda floor down to grade level with latticework as shown.

Shingles.—Where shown on elevations, shingle outside walls with good quality of 16 in. sawed white pine shingles, laid to the weather about 5½ in. and applied in the best manner, as shown; cut the butts of shingles octagonal for the second story, as shown on side walls.

Roofing.—Carpenter shall frame and construct according to drawings and sections, etc., all roofs in the most thorough manner, all thoroughly spiked and braced. Do all the necessary framing as required for gables, chimneys, etc., provide and fix the ends of rafters of size as shown, and cut to the forms shown, all to be well nailed to main rafters. Also provide and put in place, as shown on section, a gutter with moulded face, well nailed and supported, of white pine, and pitch the water to points indicated for leaders.

Make all the moulded cornices on gables, etc., as per details furnished, and all other work in gables, etc., as shown on elevations. Make cresting, etc., as shown out of 1¼ in. stuff, and furnish all turned finials as shown.

Shingles to be put on in the best manner, properly laid, joints broken, each shingle to be well nailed, and to stand away from angle of valleys 1½ in. These shingles to be of best quality white pine and laid about 4½ in. to the weather.

Windows and window frames to be as shown on drawings, made in the ordinary manner, with boxes for sash weights, to be of well seasoned white pine, weather lapped meeting rail, and to be double hung with the best hemp sash cord and cast iron weights. Cellar windows and windows in gables, as shown, to swing and made water tight.

Glass.—All the windows in first and second stories to be glazed as shown, with clear, double thick, American sheet glass. The glass for sashes in roof and cellar to be glazed with single thick sheet glass. Provide and hang to all windows on first and second stories, outside blinds, in two folds with rolling slats, hung with hinges and secured with proper fastenings, primed before coming to the building. Do all other outside woodwork shown on drawings, but not particularly mentioned.

Interior Work.

Flooring.—Lay all flooring in first and second stories with white pine flooring, tongued and grooved, not over 5 in. wide and well nailed to beams and free from large or loose knots, shakes, or other bad imperfections. All flooring to be tongued and grooved, and laid close to the outside wall, closing up all spaces completely. All joints to be leveled off smooth.

Base Boards.—There will be a 9 in. base board on first and upper floors, with moulded top.

Doors and Architraves.—All doors and window openings to have a 4 in. architrave, with turned corner block and base block high enough to receive the full base, all to be thoroughly nailed and put up in the best manner. For inside of closets a plain casing to be used. All windows on first and second stories will be finished down to sill with apron piece.

Doors.—There will be a glazed front door, as shown on elevation, 1½ in. thick. All doors on first and second story and attic shall be four panel flush moulded, 1½ in. thick, and of the sizes marked on plans. Closet door to be 1¼ in. thick and moulded on one side.

Closets.—All closets on second story one row of shelves and the necessary number of closet hooks.

Portable Coal Slides.—Construct a portable coal slide to fit cellar window, of ⅞ in. plank, and made so that they can be taken out and in with ease.

Coal Bins, etc.—Construct bins in cellar with hemlock boards as usual.

Main Staircase.—To have 1 in. riser, 1¼ in. tread, tongued and grooved together. Treads to have nosing with cove under, finished work of stairs to be put up after plastering is finished and dry; wall strings to be 1½ in., top edge moulded to correspond with adjoining base. All to be of best white pine.

Newels, Rails, and Balusters.—To be as shown on section, and details to be of selected dry white ash, all to be properly secured. Main newel turned, small newels turned, balusters turned as shown on section and details.

Privy.—Build a privy 5 x 7 feet where directed, with seat, covers, etc., to be of the usual height inside, roof hipped and shingled, window inside about 20 inches square, swinging sash, and glazed with single thick glass, paneled door, with butts, lock and bolt, exterior walls shingled eaves moulded.

Tinning.—Use the best I. C. charcoal tin for all hips, ridges, valleys, gutters, dormers, etc., the side of each sheet painted one coat before laying, and all valleys, hips, gutters, etc., painted three coats before the shingles are put on.

Gutters.—Line the gutter of main roof, and run the tin up under the shingles at least 10 inches; bring the tin over the face of cornice and tack it down and well soldered. Do all necessary tin flashings and top of window caps, etc., and do all other necessary flashing; go over the work, and stop all leaks after other craftsmen, and leave everything tight.

Leaders.—Put up and properly connect with gutter a 4 inch tin leader in front of house from main roof, with the necessary curves, bends, breaks, etc., to convey the water from the gutter. Have suitable shoes at bottom, to throw the water away from the building.

HARDWARE.

Locks.—The main entrance and vestibule doors to have mortise locks with keys, said doors to have imitation bronze fronts, butts, and knobs. All other doors on first and second stories to have mortise locks with white porcelain trimmings and iron loose joint butts. All outside bed-room doors to have mortise bolts on second story. Rim locks to all closet doors. Furnish all the necessary locks, keys, butts, drawer-pulls, etc., of imitation bronze.

Sash Locks, etc.—Furnish to all outside windows on first and second stories improved sash locks of imitation bronze.

Sash Pulleys, Weights, and Sash Line.—To all windows suitable size sash pulleys, best hemp line and weights, etc. Furnish all hinges and fastenings for outside blinds.

Closet Hooks, etc.—Furnish all necessary closet hooks, black japanned.

Furnish all other hardware necessary to make this building complete, of a quality as above specified and carefully put on, so that all doors will lock and be in good order when left.

PAINTING.

Furnish all material and perform all labor for the full completion of all the woodwork. All lead and oil must be of the Atlantic White Lead Co.'s make. All woodwork must be thoroughly cleaned off, sandpapered, cracks and nail holes stopped with putty, knots properly killed, and woodwork free from dirt and dust.

First Story.—All woodwork on first floor to be painted three coats of such colors as directed by the architect.

Second Story.—All woodwork in second story to have three coats in two colors, as directed by the architect.

Newels, Balusters, and Rail to main staircase to be filled with patent wood filler properly applied, rubbed down, and cleaned off, and finished with two coats of hard oil finish.

Outside Work.—Paint all outside woodwork included in this specification, including all roofs, etc., three coats of best white lead and linseed oil paint of such colors as the architect may direct, and all work both inside and out must be to his entire satisfaction. All paint and varnish spots to be cleaned off of walls and floors at completion of the work, and all left in a perfect state.

PLUMBING.

Furnish all materials and perform all labor requisite and necessary for putting up and completing all the plumbing work in a thoroughly workmanlike manner, according to drawings and specifications.

All water pipes must be so put in that they can be readily got at at any time for examination. All lead pipes to be secured with hard metal tacks and screws, and all lead waste connections to iron pipes to be made through brass ferrules. Iron waste pipe to have joints calked with oakum and run with molten lead.

Sink.—Furnish and put up a galvanized iron sink, where shown in kitchen, with cold water supply and brass cocks, and waste through a 2 inch lead pipe with trap and trap screw, and connected with 2 inch iron waste pipe running to cellar. Make all the proper cold water connections.

Pump and Supply Pipe.—Set in kitchen, alongside of sink, a double-acting pump, and make all the necessary connections with 1 inch galvanized iron pipe from well.

$2,600 SUBURBAN COTTAGE.

CHAS. E. HEBBERD, ARCHITECT, 62 BROAD ST., N. Y.

This illustration represents one of five detached cottages erected at East New York. The contract for entire work, including painting and plumbing, was given out at $2,600 each. The building has a frontage of 21 ft by 30 ft. 6 in. deep, and a one story extension 10 ft. x 18 ft. Height of first story, 10 ft; second story, 9 ft. 6 in. Attic left unfinished, but with sufficient height and light to admit of finishing two good sized rooms if wanted. Cellar under entire building, 6 ft. 6 in. high. Foundations above ground of brick laid in red mortar; all cellar openings furnished with bluestone sills, outside cellar steps and coping of bluestone, chimneys furnished with bluestone cap with flue openings cut out.

Lathing, plastering throughout in two coats, and hard finished cornice in parlor, dining room, halls, and front bed room. Timber of frame of spruce. Frame covered with mill-worked sheathing, put on diagonally, this covered with heavy rosin-sized sheathing paper, and then inclosed with 6 in. clear beveled clapboards. Shingles with ornamental ends placed where shown. Posts of porch and railing turned. Floors throughout of white pine, 5 inches wide. Inside finish of white pine with moulded pilaster, finish with corner and base blocks.

Doors throughout paneled; 1½ inch room doors, 1¼ inch closet doors. Windows glazed with double thick French sheet glass, with marginal lights of cathedral glass in upper sashes; outside blinds throughout.

Kitchen provided with sink and wash trays. Chair rail on walls of dining room. Picture mouldings throughout. Slate mantels in parlor and dining room.

Tin Roofing Plates.

If the foundation of a building is paramount in construction, as doubtless it is, the roof which is to protect the whole edifice is only second in importance. The qualities of tin as a roofing material rank high, as may be amply proved by the great popularity it has attained during the past few years. Convenient in application, durable, and very economical, it has gained in favor and is now employed to a far greater extent than any other material throughout the country.

Of late, tin roofing has been severely attacked on all sides. With the competition of these days and the consequent reduction in the price of roofing of this description, much of the material has been of far inferior quality to that produced in former years. With the lowering of price, we get a corresponding reduction in the quality of the material, so that at the present time the market is stocked with tin plates, many of them of so inferior a quality as to be wholly unfit for their purpose.

Under these circumstances, it is a pleasure to refer to the plates of Messrs. Merchant & Co., of No. 525 Arch Street, Philadelphia, who have also offices at New York and Chicago. This well-known house issue the first quality of plates in the market, under the name of "The Gilbertson Old Method." They are of far greater weight than usual, averaging 120 pounds for each box of I. C. 14 × 20, and have an extra thick coat of uniformity and quality. To prevent fraud and guarantee that the purchaser shall get what he is paying for, each sheet is stamped with the name and thickness of the metal, and thus the owner and architect have insured the proper performance of the contract by the builder, in this important respect at least.

We have not space here to show the material gain from a pecuniary point of view, effected by the use of a good quality of roofing, but that it is the truest economy in the end there can be no doubt.

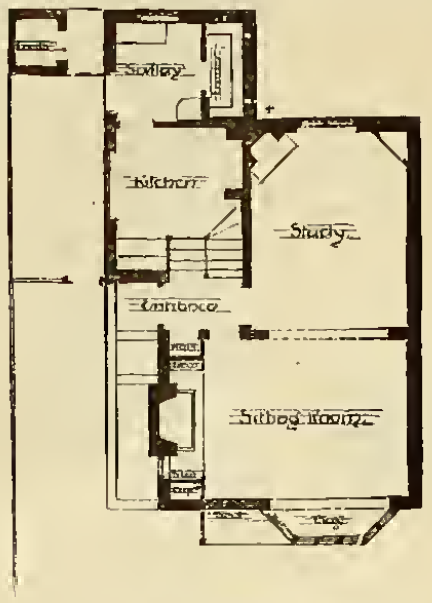
The house of Merchant & Co. has long been identified with the best quality of tin plates, and no better proof could be had of the justice of this than the fact that their goods were chosen, after undergoing the most thorough and severe tests, for the White House at Washington, and this at a price higher than that of their competitors.

We have had enough of bad roofs and more than sufficient of the grumbling of builders, owners, and architects at the poor quality of tin plates. Let them use the goods of Messrs. Merchant & Co., and see that they are properly laid, and there will be no further cause for either the one or the other.

The Richmond Weather Strip Co., Richmond, Ind., report an unusually good trade for 1886. They have sold over 20,000 of their strips for bottoms of doors, and 200,000 feet of Excelsior rubber stripping for sides of doors and for windows.

AN ENGLISH COTTAGE.

We give from the *Architect* an elevation of "Thought Cot," an English cottage for Mr. W. Norman Marshall, Brentwood, Eng. The building is to occupy a limited piece of ground. We give a small plan of lower floor. The others will be readily understood. The architects, Messrs. H. & E. Marten, have endeavored to utilize to the best advantage a limited frontage. One spacious room is obtained on the ground floor capable of division by sliding partition; also small kitchen, scullery, and



PLAN OF LOWER FLOOR.

larder. Five bed-rooms are obtained on mezzanine, first, and second floors, together with bath-room, water-closet, and box-room. A hall with fireplace, and an additional sitting-room over, are now in course of erection. The materials used are red bricks. The roofs are covered with red tiles, which contrast pleasantly with rather more than the usual amount of white paint. The spaces between framing in gables are filled in with dark rough cast in cement.

Drilling Holes in Plate Glass.

The last volume of the "Transactions of the American Society of Mechanical Engineers," recently issued, contains a discussion on the best method of drilling holes in plate glass, which contains some points of interest to our readers. Mr. Durfee mentioned his successful experience in drilling holes three-sixteenths of an inch in diameter through glass plates about one-eighth of an inch thick, by the use of an ordinary bow drill, with spirits of turpentine as lubricant. The holes were drilled from one side until the drill just punctured the opposite side of the glass; then the glass was turned over and the holes finished by drilling from the opposite side.

Mr. Oberlin Smith recorded fair success with a very hard drill and the same lubricant in drilling holes one-half inch in diameter in plates one-quarter of an inch thick; but instead of turning over the glass, he put a piece of perfectly flat cast iron under the glass, with a little piece of paper between, clamping all firmly together, and permitted the drill to puncture the iron a little.

Mr. Ashworth referred to the remarkable efficacy of the sand blast steam jet in drilling holes through glass, and Mr. Towne stated that that was, undoubtedly, the best method where the work is to be done in large quantities and can be sent out to be done. But for doing the work in small quantities in one's own establishment, he instanced the method employed in the works of the Yale & Towne Manufacturing Company for drilling holes seven-sixteenths of an inch in diameter through glass one-eighth of an inch thick. The best tool for the work was found to be a brass tube five one-hundredths of an inch thick, the cutting agent being emery, No. 5 H, and the lubricant simply water, which they had found as efficient as oil or turpentine, and much less troublesome.

Thus the workman was able to drill thirty to forty holes per hour, the drill being run at 2,000 revolutions per minute, and the drilling of forty holes through the one-eighth inch glass using up about one inch of the tube. Mr. Towne added that it was important to keep the emery well washed and cleaned, that is, with the dust removed from it which results from the abrasion of the glass.

For small holes, Mr. Stetson could conceive of nothing better than the diamond drill.

Drain Pipe Traps.

In the convention of the American Institute of Architects, held in New York city, Dec. 1, 2, and 3, a report was presented by Mr. Glenn Brown, architect, Washington, D. C., on the subject of experiments in "Trap Siphonage."

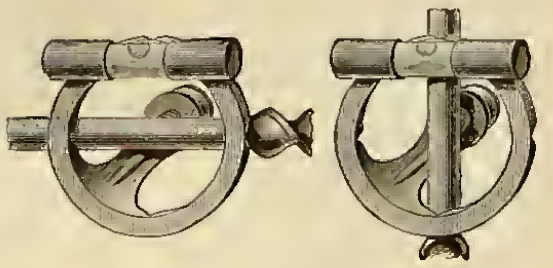
The investigations relating to this subject were carried out at the Museum of Hygiene of the Navy Department, at Washington, D. C.

The experiments have been conducted with the view of obtaining simply facts, without the ulterior object of introducing some patented article, where commercial interests are concerned. There were tests made of existing systems of trap ventilation, and patented traps that claim to need no ventilation. In testing the different forms and manufactures, the fixtures were subjected to a strain equal to what they would receive in actual use, and also strains more severe than ordinary uses, and intended to cover unusual demands. To quote from the report: "The majority of the experiments have been made to test the power of the traps to resist siphonage and back pressure produced by the column of water passing down the vertical pipes. The question of first importance is: *Does ventilation protect the seal of traps in ordinary use?*" Ninety-nine tests of vent pipes and traps are recorded in the report, "in all of which the vent pipes were open and a positive effort was made to break the seal of the traps," except in "the first experiment, when the fresh air inlet at the foot of the soil pipe, and the opening at the roof, were closed, in this way subjecting the traps to the greatest strain which they could possibly have to resist, for either siphonage or back pressure." The deductions arrived at, according to tests, are as follows:

1. The seals of ventilated traps are safe against siphonage and back pressure.
2. The seals of unventilated traps are never safe from siphon action or back pressure, except in deduction four.
3. The vertical vent should be three inches, with a four inch soil pipe.
4. Traps connected on a horizontal pipe and fixtures discharging on the same level into horizontal pipe apparently have no effect on unventilated traps.
5. All varieties of non-mechanical traps are more easily affected by back pressure than by siphonage.
6. The ball traps were not affected by back pressure, but by siphonage.
7. The Sanitas trap withstood siphon action better than any of the patent traps, but was easily affected by back pressure.
8. The sewer air is more liable to enter unawares by back pressure through the seal of the trap, because the seal remains unbroken.
9. Difference in friction of iron and lead pipes made no apparent difference in the effect on the traps.

BIT AND SQUARE LEVEL.

The very trite saying, "*Necessity is the mother of invention*," is verified again in the birth of the little article illustrated in this column. Every mechanic



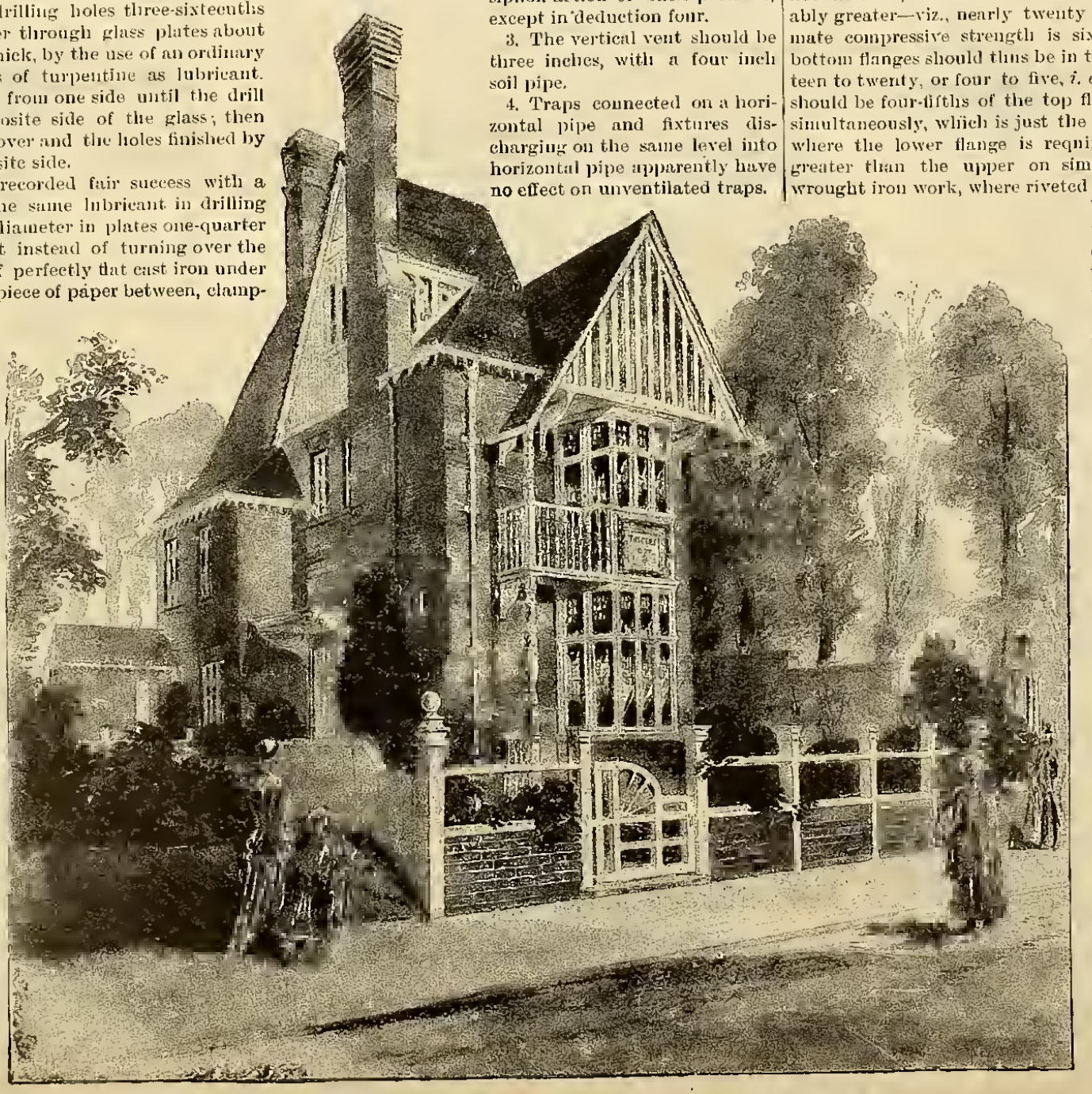
BIT AND SQUARE LEVEL.

realizes the necessity of boring with precision; but the methods for doing so have not been easy, or always reliable.

The article shown here is made of brass, and has three pairs of V slots, in either of which the shank of a bit will lie; and when secured by the thumbscrew, accurate boring can be done vertically, horizontally, or at an angle of 45°. Another use of this ingenious device can be made by attaching it to one leg of a framing square, thus forming a substitute for a spirit level, while the other leg of the square will indicate an exact plumb line. The Stanley Rule and Level Co., New Britain, Conn., are the manufacturers, and hardware dealers keep them for sale.

Top and Bottom Flanges of Wrought Iron Beams.

It is obvious that if twelve tons per square inch were the ultimate tensile strength of wrought iron, such beams should have the same quantity of material in both their upper and lower flanges. This is, however, not the case; the ultimate tensile strength is considerably greater—viz., nearly twenty tons—while the ultimate compressive strength is sixteen. The top and bottom flanges should thus be in the proportion of sixteen to twenty, or four to five, *i. e.*, the bottom flange should be four-fifths of the top flange for both to fail simultaneously, which is just the reverse of cast iron, where the lower flange is required to be six times greater than the upper on similar grounds. With wrought iron work, where riveted plates are used, the bottom alone is weakened by the rivets passing through the plates, the top remaining uninjured as regards compression, and on this account (neglecting the rivets in the calculation) little difference is practically made in the area of the top and bottom flanges of such girders.—*Edwin Clark, in the Architect.*



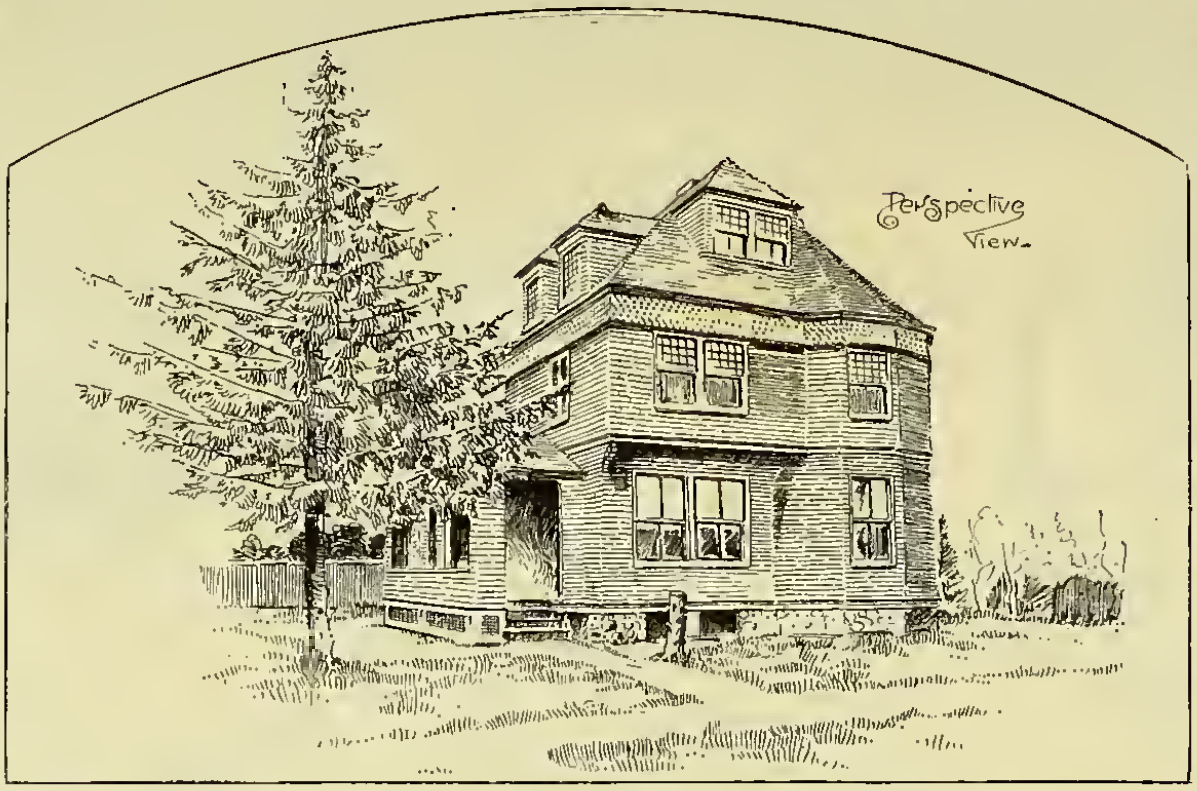
THOUGHT COT, BRENTWOOD, ENGLAND.—H. & E. MARTEN, ARCHITECTS.

AN incidence window for lighting basements, vaults, etc., has been patented by Mr. Isidor Schoenberg, of Baltimore, Md. It is composed of a frame with a parallel series of glass blocks of right-angled triangular shape, with their long sides in the plane of the frame, the blocks projecting upwardly to expose their two sides, so as to give the greatest amount of exposed reflecting surface without shoulders, while the faces of the prism are readily accessible for cleaning.

DESIGN FOR A $2,000 COTTAGE FOR GEO. GABLE, ESQ.

EDWARD KENT, ARCHITECT, BUFFALO, N. Y.

This house is situated in Lancaster, Erie County, N. Y., and was built complete for the above cost. The original contract price was $1,900, but additional plumbing put in by owner brought the price up to $2,000. —*Building.*



DESIGN FOR A $2,000 COTTAGE FOR GEO. GABLE.—ED. KENT, ARCH., BUFFALO, N. Y.

The Architectural League.

SOME NOTES AND COMMENTS ON ITS SECOND ANNUAL EXHIBITION.

BY OUR SPECIAL CORRESPONDENT.

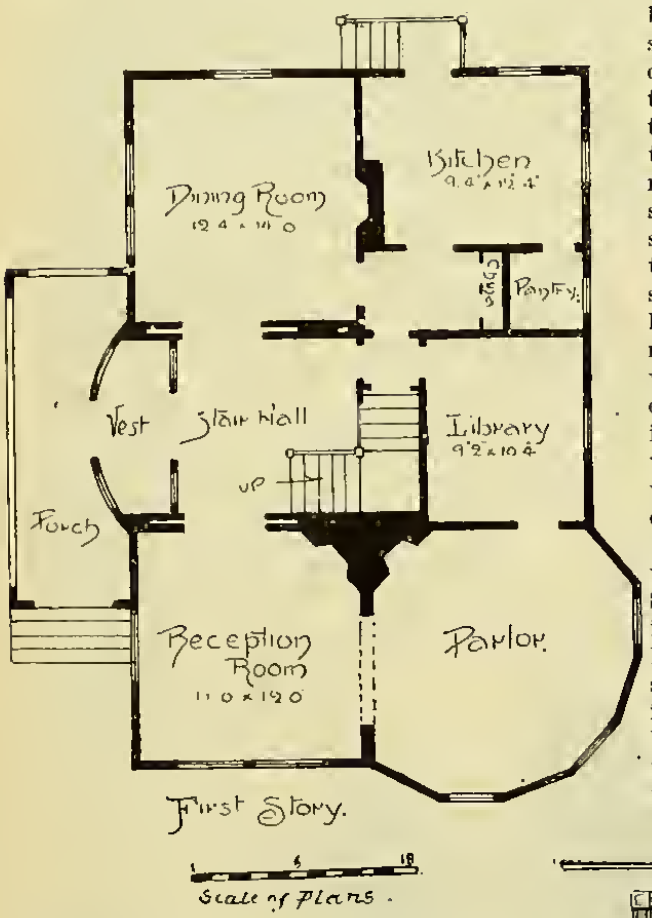
The League is an association of gentlemen who are interested individually and collectively in architecture as an art. Its membership comprises architects, artists, sculptors, painters, engravers, decorators, draughtsmen, and a few art amateurs. Its purpose is for mutual improvement in the technical and æsthetic arts, and it has faith to believe that so long as its membership is confined to persons who have some appreciation for art, it will continue to be successful. Its second annual exhibition was held this year at the American Art Galleries, in conjunction with the Salmagundi Club and the American Black and White Societies. The exhibition was opened on Monday, the 10th of January, and closed Wednesday evening, January 26th. The daily press of the city, in their meager and uninteresting notices, spoke of it in laudatory terms, and concurred in the desirability of such an undertaking. At its first exhibition the drawings were of too technical a character to obtain the attention they were entitled to, and some dissatisfaction was expressed at the result; but this year it was quite evident that better work had been done by the jury in its selection, although the efforts of its hanging committee were far from successful. The one hundred and eighty-nine drawings exhibited almost as great a variety in subject, style, and execution as the quarters of the world from which they came. While the subjects chosen to represent the League were excellent and interesting of themselves, almost every one, it must be confessed that the juxtaposition of detail sketches from Fontainebleau with Canadian court houses, Nantucket sketches, and cemetery gateway competitions looked rather kaleidoscopic. The suddden jump, for instance, from a New York printing house to a noted French cathedral, and from there to a chapel in Brooklyn, and back again to Europe, without any bridge, to Durham Castle and Cathedral, was, to say the least, rather astonishing. If variety was the Ultima Thule, it was certainly attained. If any connection could have been established by such an allowable architectural feature as a transition of style of some building in America from some building in Europe, the studied contrast would have succeeded in distinguishing the contiguous drawings or designs. If the various sketches from France, such as the Manoir de la Houblonniere, the sketch of Rouen, the very interesting bits of detail from Fontainebleau, the Amiens Cathedral, the quaint sketches in Normandy, the church tower of Darnetal, the Paris street scenes, the Roman monuments at St. Remy, and other sketches from France, had been placed in a group, they would have furnished ample variety and at the same time a sequence of contrast that would have heightened the interest in all of them. The same remarks will apply to the remarkably interesting but widely distributed sketches from Italy. There were enough to have made an effective group from Rome itself. The colored scraps of decoration from the Vatican were rendered in the highest style of artistic color work, and they alone were worthy of an hour's study of anybody's time.

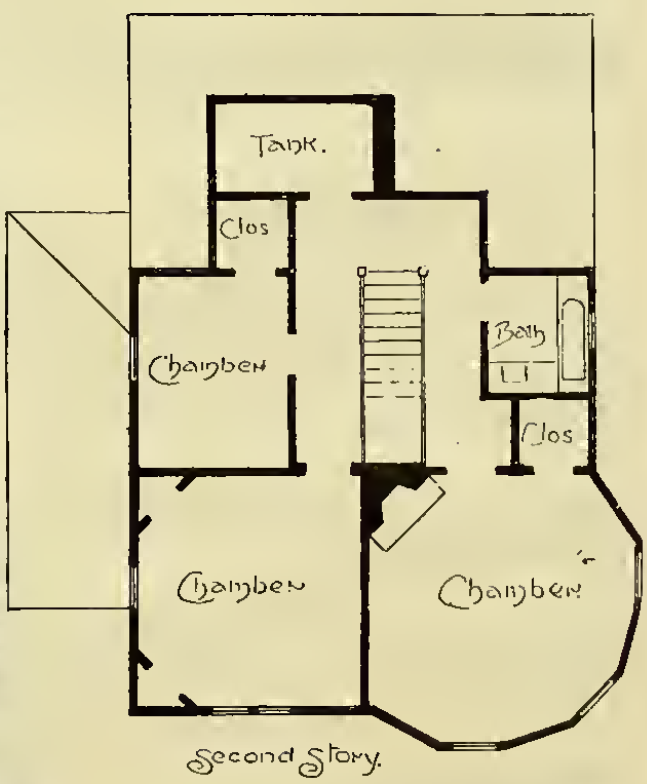
The favorite Venice was well represented, such as the Palazzo Greco, the Grand Canal, St. Mark's Square, and others. Carrying out the thought of some inter-relation, it would have made an effective group to have placed the various designs of school buildings in such proximity as to have invited a comparative examination. The advantages of such an arrangement will be apparent at the mere mention of the designs submitted, viz.: The American School of Classical Studies in Athens, the State Normal School and the Lawrenceville School, both of Massachusetts, and a school and chapel of Chicago, Illinois.

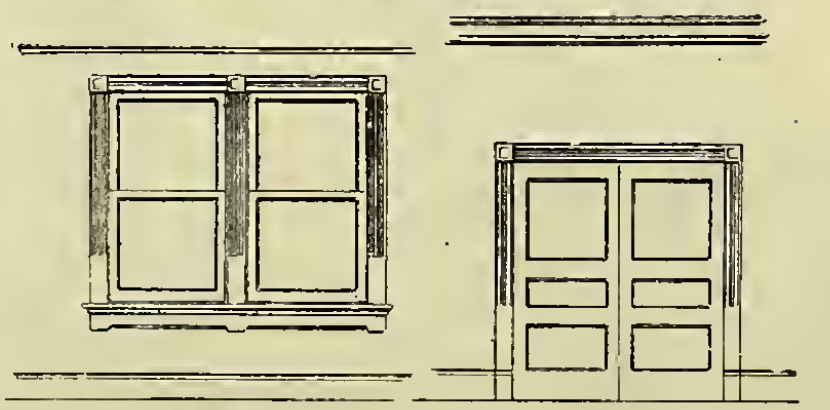
A great many designs of churches were exhibited, but they were so scattered among the foreign sketches and country houses that no one could have brought away an intelligent conception of their number and character. If other buildings of a class, such as club houses, country residences, city warehouses, and others, had been arranged so as to have been studied by comparison and grouping, the profession itself would have been as greatly benefited as its clients. The fertility of resource and ingenuity of conception displayed by these drawings were so great as to avert all danger of monotony or commonplace by the ordinary methods of grouping. The writer is enough of a Philistine to believe that if an exhibition of drawings, paintings, or statuary is gotten up with the purpose of making a showy effect, without attempting to be instructive in any particular, the spectacle ought to be treated as a show, and not as an exhibition hallowed by the name of art.

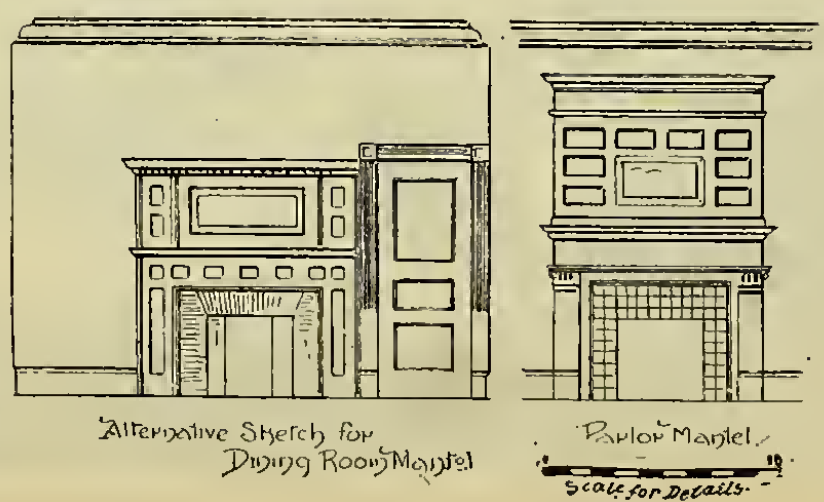
Some of the most interesting drawings were groups of what were styled alternative studies of country houses. The transitions were readily discernible and pleasing, and the differences sufficiently accentuated, but they would have been more attractive and comprehensive if the architect had furnished drawings of his plans of the interiors that originally accompanied them.

Many of the drawings shown were the originals of illustrations which have appeared from time to time in this and other architectural journals. We looked in vain for any signs of the architectural future; but as this was only the second exhibition of the League, perhaps it was unfair to have looked, but certain tendencies were discovered, and may be pointed out. As an instance of adaptation to the local needs, we noticed the study of a design for a city house, in which a Philadelphia architect had planned a corner house so that its principal rooms were lighted as well as a London drawing-room. It needs no prophet to predict a phenomenal success for the architect who can build a house on a twenty-five foot city lot, in which every room is abundantly lighted. The subject of light led to the discovery of the large number of plans which contained designs of square-headed Tudor-Gothic windows, the upper bars so high up as to make of the topmost sections a set of transoms, grouped together as in the modern English style. While this may look decidedly like a tendency toward such window construction, it might have been









only a series of coincidences, and if it was the former, it is worthy of being recorded.

The general symmetry of the roof lines was quite noticeable, and must be ascribed to a studied effort on the part of our architects to make them so. Taking each design separately, without any reference to the counter-effect of its neighbor upon itself, it gave every true lover of art progress a pleasure to note the symmetrical arrangement of contrasts, not a mere vulgar, wearisome balance of parts, but a recognition of the wider inter-relationships of constructive and decorative features, and in this very recognition we hail the promise of a bright future.

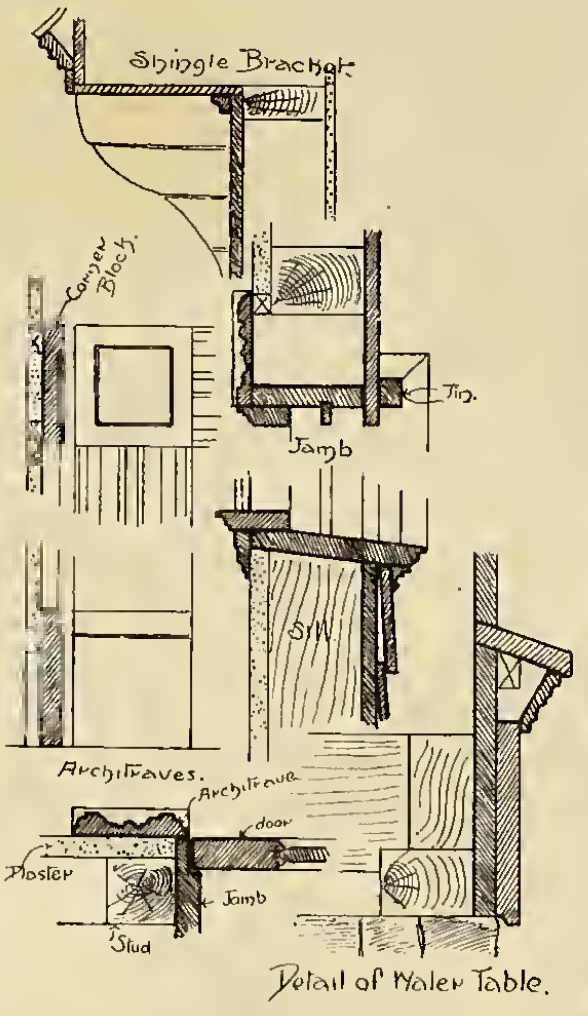
As the late Mr. Ferguson has rightly said, the present unsettled state of architecture is a misfortune to the art. The causes lie deeper than architects can control; they cannot change the spirit of an age, but they can adapt themselves to its greatest needs, and in many ways can indicate by their works what ought to be done.

One of the best means of crystallizing and educating architectural taste is the annual exhibition of designs of current work; and if the best good of the profession is desired, rather than an opportunity for a display of personal vanity, these exhibitions must be conducted upon such a wide and liberal basis as to afford an instructive lesson rather than a passing spectacle to those who take the trouble to attend them. It is our people as a people who need cultivation in the arts, and not the architect, who has spent the most precious years of his youth and his life in acquiring that broad and fundamental culture which the world willingly acknowledges belongs to him because of his profession. Where so much that has been done has been well done, it is rather trying to have to say it might have been done better; but the tendency to exhibit perspective sketches without the keys to them, viz., the plans, elevations, and sections in detail, is a reprehensible one, and should not be countenanced by the League.

There can be no doubt that every architect desires to see the art of building elevated to a fine art, and to reach that stage it must possess proportion and expression. It may be that some of us who visited the exhibition are deficient naturally in the power of perceiving beauty, or that we lack the truest refinement in form, color, or modulation of light and shadow; but if we have any such perception, be it never so little, it can be cultivated by being appealed to, and until it is brought to some visible state of culture, architects and the people at large may look in vain for the dawn of an American style of architecture.

An American Coaster.

The loftiest spars at the South Street piers below Wall Street recently were the three masts of the new schooner William W. Converse, fresh from Hanscom's yard at New Haven, where she was launched on Dec. 15. An examination of the Converse shows the wonderful progress made in the construction of coasting vessels in the last few years. Although under the present rules of measurement the Converse registers 708 tons, she will carry 1,200 tons of cargo, quite as much as the square-rigged ships of a few years ago and fully as much as the average bark of the present time. She does this on a draught of 15½ feet of water, and she

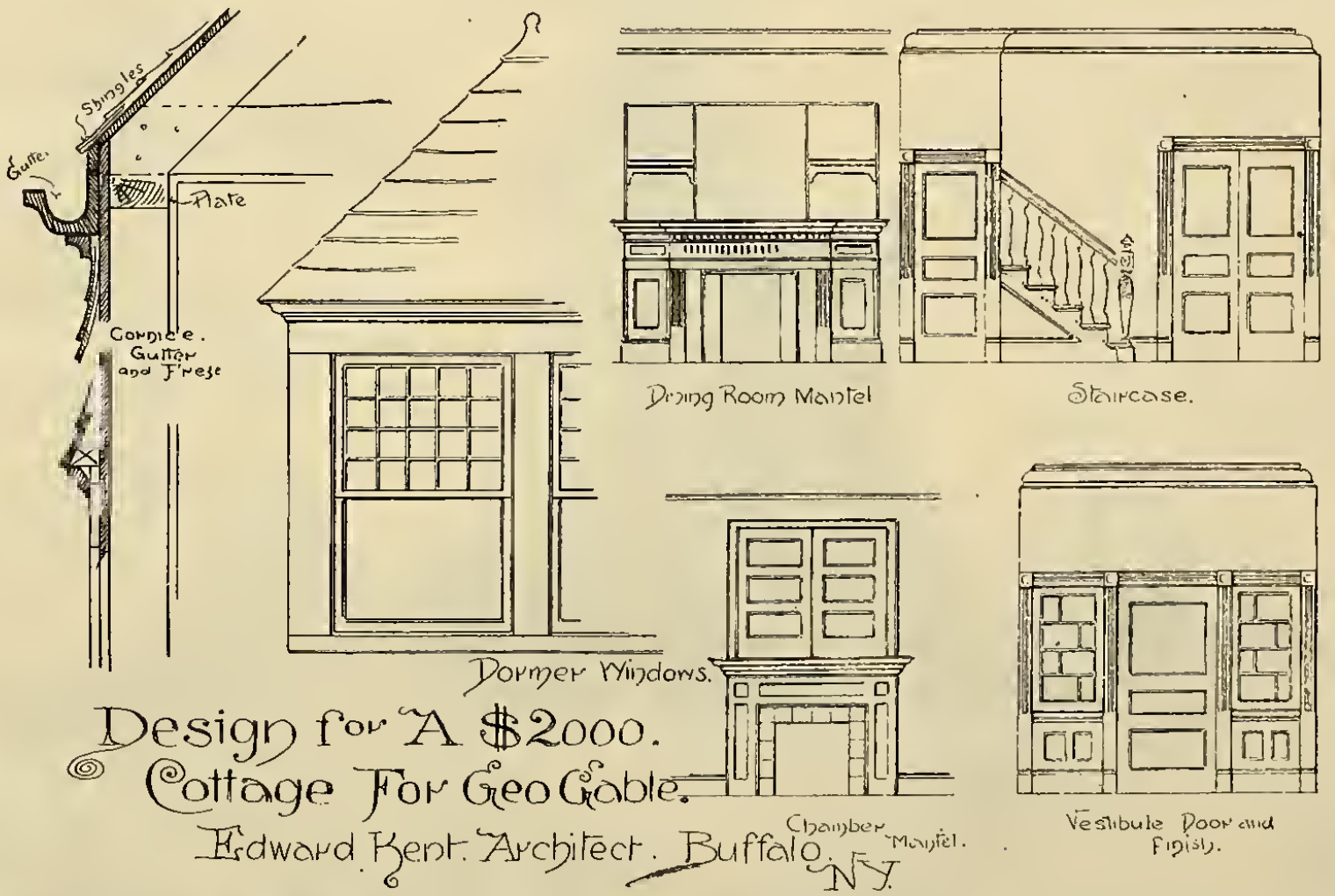


The dimensions of a vessel of this kind are not uninteresting. Her spars are from 94 to 93 feet long. Her topmasts 56 feet. Her spanker boom is 70 feet long, and her jibboom 60. The fore and main booms are 48 feet, and all gaffs 46. It required 5,000 yards of canvas to clothe her. Her frames are white oak and chestnut, and she is ceiled and planked with yellow pine. As a sample of her strength, it may be said that from the bottom of her keel to the top of her keelson the logs are piled up eight feet high. It took ten tons of bolts to hold them together. She is the second vessel fitted with the patent tubular steering wheel, which is a model of strength and beauty.

The Converse is noticeable for her finish as well as her strength. The mouldings and panels of her cabin are in cherry, walnut, and ash, beautifully contrasted. The floors are carpeted with Oriental rugs an inch thick. There is a set of solid silver on the sideboard and no end of rich and beautiful decorations about the bulkheads. The curtains before the berths are of silk, and the furniture of the after cabin is upholstered in silk also. The house forward is divided between the cook and the crew. Although Jack will have no silk curtains before his bunk, he will find a lot of comforts which he seldom finds in coasters, and which he will like much better than silk hangings.

The Converse is commanded by Captain James M. Seaman, a Saville man. In all matters pertaining to the handling of the ship, he is the boss, but it is pretty plain to a visitor that in domestic matters his handsome little daughter Maude, a lassie of eleven years, is the ruler. Captain Seaman formerly commanded the Tingue, a famous schooner, and little Maude sailed more thousands of miles in her than she is years old. Maude helped launch the Converse by breaking the wine bottle over the knightheads in the presence of 5,000 enthusiastic spectators. The state room which this young sailor girl calls her own is as large as the captain's, and quite as handsomely decorated.

A friend of Captain Seaman told a reporter that the Converse cost $38,000—a figure that compares with the cost of a square-rigged vessel of equal capacity in a way likely to make old-fashioned ship owners open their eyes. The Tingue, which Captain Seaman commanded last, paid twelve per cent net profit while he was in her. The Converse is expected to do rather better, in spite of the hard times. One reason for expecting this good fortune, the captain says, is that he found upward of sixty horseshoes while superintending her construction, and he picked them all up and stowed them away. He never passes a derelict horseshoe. He owns one-eighth of the new vessel.—*N. Y. Sun.*



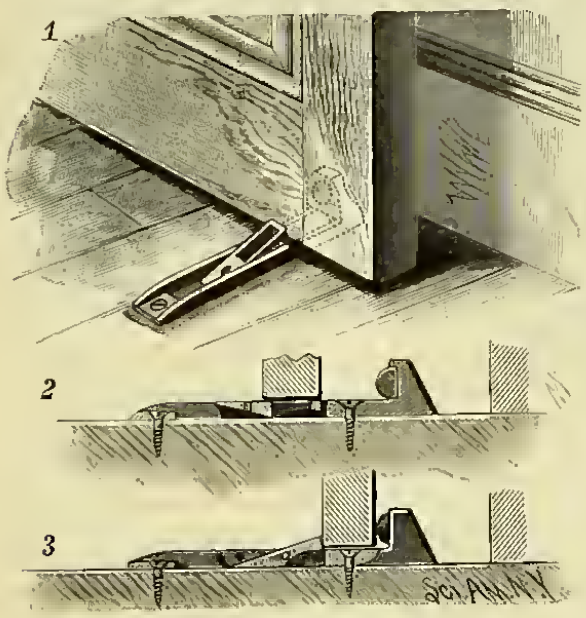
Notwithstanding our restrictions upon the manner in which so much good material was displayed, it remains for us to say, and with pleasure, that the widespread interest manifested in their work ought to endue the League with new vigor, inspire them with noble purposes, and urge them on enthusiastically to higher and better work.

TURTLE shells may be softened by hot water, and if compressed in this state by screws in iron or brass moulds, may be bent into any shape, the moulds being then plunged into cold water.

THE construction of sash windows forms the subject of a patent issued to Messrs. Vaclav Klan and Rudolf Seitz, of Prague, Bohemia, Austria-Hungary. The invention is for windows having an upper and lower outer and an upper and lower inner sash, all the sashes being mounted to slide and to swing on pivots, and counterbalanced by weights in such manner that they can be swung inward on hinges to facilitate cleaning or repairing.

IMPROVED DOOR CHECK.

This simple device is for arresting the motion of a door while being opened and for fastening it in an open position. The base plate is formed with a longitudinal slot extending through the greater portion of its length, and has at one end a right angled arm, formed with a chamber for receiving an elastic buffer. In opposite walls of the slot are formed series of diagonal slots, inclined away from the buffer, and to the slot is fitted a latch having, near its center, trunnions, which may be placed in any pair of diagonal slots, according to the thickness of the door. The



HINKLE & JEFFERY'S IMPROVED DOOR CHECK.

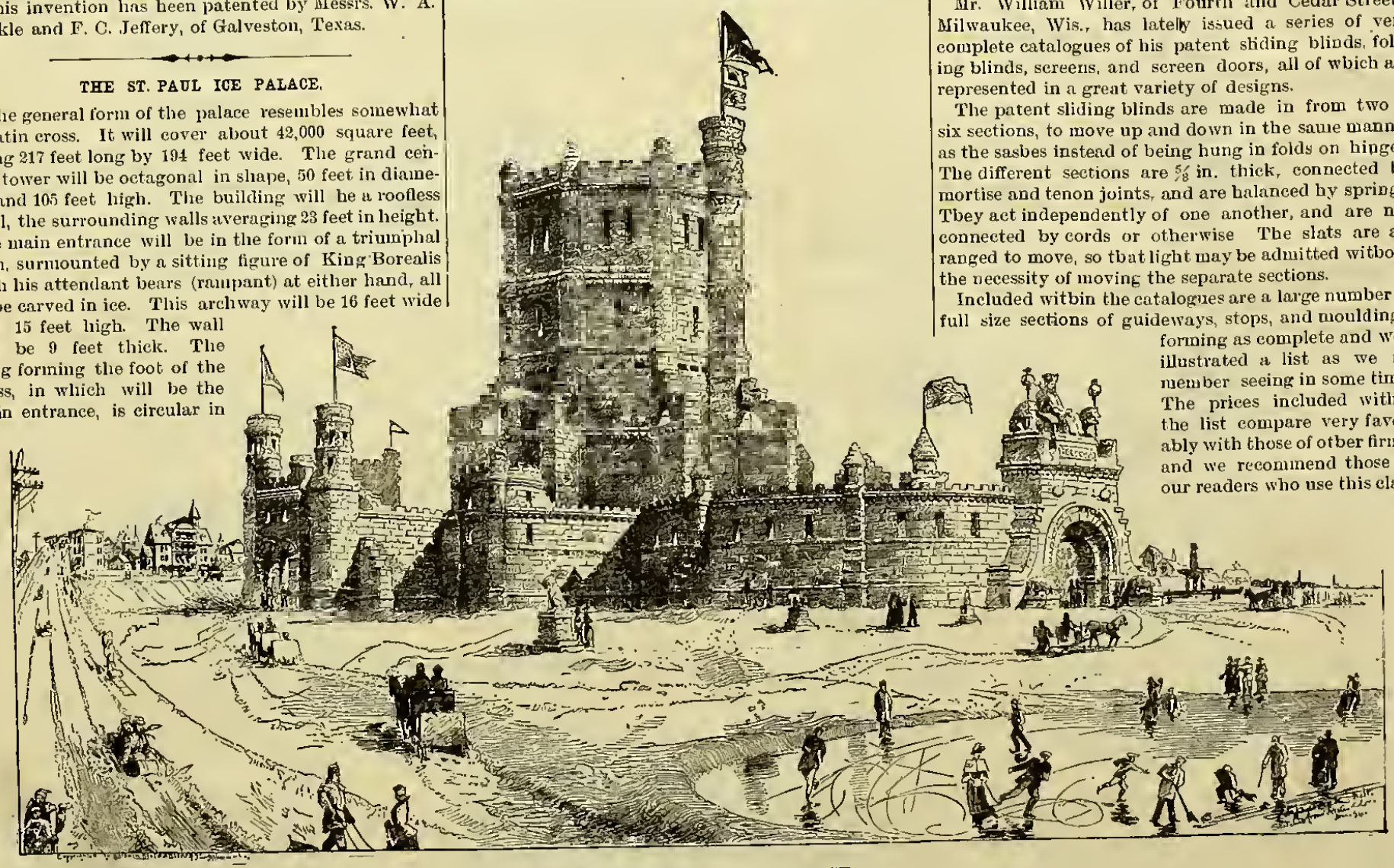
weight of the latch is so distributed that, normally, the end next the door will project above the plate and into the path of the door. The door check is secured to the floor with the buffer at the point where it is desired to arrest the door when opened, and the trunnions of the latch are placed in a pair of the slots, so as to leave a space between the end of the latch and the buffer, about equal to the thickness of the door. When the door is opened, it glides over the latch, as shown in the sectional view, Fig. 2; and when the door has passed the latch, the lighter end of the latter rises in front of the edge of the door, and holds it in an open position, as shown in Figs. 1 and 3. The latch is operated by gravity alone, and the check is not therefore liable to derangement.

This invention has been patented by Messrs. W. A. Hinkle and F. C. Jeffery, of Galveston, Texas.

THE ST. PAUL ICE PALACE.

The general form of the palace resembles somewhat a Latin cross. It will cover about 42,000 square feet, being 217 feet long by 194 feet wide. The grand central tower will be octagonal in shape, 50 feet in diameter and 105 feet high. The building will be a roofless shell, the surrounding walls averaging 23 feet in height. The main entrance will be in the form of a triumphal arch, surmounted by a sitting figure of King Borealis with his attendant bears (rampant) at either hand, all to be carved in ice. This archway will be 16 feet wide and 15 feet high. The wall will be 9 feet thick. The wing forming the foot of the cross, in which will be the main entrance, is circular in form, 95 feet in diameter. Each of the other wings, forming the head and arms of cross, will also terminate in an entrance, but of minor importance. The whole affair will be pleasing in effect and magnificent in proportions.

Our engraving is from the *Northwestern Architect and Improvement Record.*



THE ST. PAUL ICE PALACE.

Plain Wall Paper for the Sick Room.

In a recent lecture on nursing, Miss Kelman illustrated the need of having the walls of hospitals of a quiet and unobtrusive color, by telling an anecdote of a patient—an old gentleman—who was heard continually muttering "Fourteen up, thirty-five across." This fact arrested the attention of the doctor and nurses, who examined the room and ultimately found that the pattern of the paper was divided into squares of fourteen up and thirty-five across. When the old gentleman fell asleep he was quietly removed to another room, where, the wall paper being of a neutral tint, he quickly recovered.—*The Hospital.*

Explosion of Wood Dust.

We take from the Ohio *State Journal* the particulars of the recent explosion that occurred at the Columbus Buggy Co.'s works.

The catastrophe occurred in building No. 4, on Front street, being the west portion of the works, and the building just erected as an engine and boiler room on the lower portion, with the Backus dust arrester on the top floor. This is 20 by 40 feet, and was put in at great expense, being used to collect the dust from all parts of that building by means of shafts, the action of its machinery drawing it up to the arrester and shaving vault. From there a great chute extends to the engine room below, divided into two apartments. All is made fire proof. Through this chute the shavings and dust from above are swept at proper times, falling to the engine room, where they are burned. There are two doors, one in each apartment of the chute, opening into the engine room. Into one the shavings fall, and that door can be opened without danger, but the other should never be opened while the dust was being thrown down from the vaults above. An examination shows that disregard of this was the cause of the disaster, and all of the theories previously published are entirely wrong. It appears that at the noon hour, while the machinery was not going, Joseph Brown, colored, went into the arrester as usual to sweep it out and throw the dust down the chute. While he was thus engaged the fireman below, in violation of the rules, is said to have opened the door of the apartment into which the dust was falling. As he did so the dust puffed out in greater quantities, covering him and filling the engine room. The furnace fire is but six feet away, and the dust, which is very combustible, and being so fine as to act almost like powder, made, as it were, a train, which ignited and carried the flames to the chute, thus causing the explosion. As the force of the explosion shot up through the chute and into the arrester, thus extending in all directions, the roof was blown skyward, and the walls of that portion of the building were scattered in fearful destruction. The large quantities of brick, mortar and heavy timbers fell with crushing force upon some of the smaller buildings below, doing considerable damage, and played great havoc with the telephone and telegraph wires and poles. Brown was blown into the air and fell on the roof of another lower building, where he crawled from the debris, badly burned and with considerable skin torn from his hands and neck. He subsequently died.

The damage was confined to the walls of the large building, its roof, and roofs of the lower buildings. Loss, $3,000.

COMFORT AND STYLE TOO.

So long as it is the fashion for ladies to wear bustles of the pronounced amplitude now favored by so many

COMBINED STOOL AND BUSTLE.

of the fair sex, we do not see why the fact may not be taken advantage of to introduce an invention calculated to make it convenient for them frequently to rest from the fatigue of long standing or walking. Such, at least, we presume to be the idea of the inventor of the device shown in the accompanying illustration, for which a patent has recently been issued. The transformation the style has effected in the appearance of a lady properly fitted out in walking costume is something really wonderful, and we are not surprised, therefore, that several other inventors have rushed into the same field, with devices which would not otherwise have been thought of.

Sliding Blinds.

Mr. William Willer, of Fourth and Cedar Streets, Milwaukee, Wis., has lately issued a series of very complete catalogues of his patent sliding blinds, folding blinds, screens, and screen doors, all of which are represented in a great variety of designs.

The patent sliding blinds are made in from two to six sections, to move up and down in the same manner as the sashes instead of being hung in folds on hinges. The different sections are ⅝ in. thick, connected by mortise and tenon joints, and are balanced by springs. They act independently of one another, and are not connected by cords or otherwise. The slats are arranged to move, so that light may be admitted without the necessity of moving the separate sections.

Included within the catalogues are a large number of full size sections of guideways, stops, and mouldings, forming as complete and well illustrated a list as we remember seeing in some time. The prices included within the list compare very favorably with those of other firms, and we recommend those of our readers who use this class of goods to send for a copy of the catalogues, which we believe are sent free of charge.

For brassing small articles: To 1 quart water add half an ounce each of sulphate copper and protochloride of tin. Stir the articles in the solution until the desired color is obtained.

INCANDESCENT BURNER OF DR. AUER.

The peculiar feature of the gas lamp of Dr. Auer von Welsbach consists in the incandescence of certain metallic salts placed in the middle of the flame of a Bunsen burner. The principle is not new; it is the same as that in the Clamond lamp, in which, as may be remembered, the incandescent substance is formed by a little thimble of magnesia threads. On the other hand, the arrangement of the Auer burner is very simple, and appears to possess many advantages. It consists of an ordinary Bunsen burner, the end of which is covered by a hood of cotton or woolen tissue washed in a special preparation. The hood, about 6 or 7 centimeters in height, is slightly flaring and is held by a platinum thread which passes around it and is fixed to two rods of iron connected with a ring above. The longer of the two is held by a thumb screw to the pipe which supports the burner.

NEW INCANDESCENT GAS BURNER.

As soon as the burner is lighted, considerable heat is generated within the hood, which, in a few seconds, becomes aglow with a whitish blue light, remarkable for its steadiness and intensity.

It is not perfectly well known how the hood is made, but here are a few details from the patent of Dr. Auer, which throw some light on the subject: Take a solution of zircon and nitrate or acetate of lanthanum or yttrium, and soak in it the woolen or cotton that is to form the hood. The tissue is then carbonized, and leaves a sort of network, which is applied to the Bunsen. The nets thus procured appear more favorable to the production of light than the massive cylinders of zircon tested in 1868 by Tessie de Mottay on oxyhydrogen burners.

According to the inventor, each hood costs about 1 cent, and will last 1,000 hours, or until the dust of the atmosphere is sufficiently incrusted thereon to diminish the strength of the light. Finally, with equal lighting power, the consumption of gas in the Auer burner will be about one-half less than that of an ordinary burner, which should show an economy of 50 or 100, but these figures ought to be verified. The durability of the hood ought also to be determined by exact tests.—*La Nature.*

JOSEPH ECHTELER'S DESIGN FOR A GRANT MONUMENT.

Fourteen competitive designs for a monument to General Grant, to be erected in New York, have been sent in, and among these the design of a German who has lived in America for two years is especially noteworthy. Thinking that many of our readers may be interested in the design of Joseph Echteler, we give a cut of it, taken from the terra-cotta model.

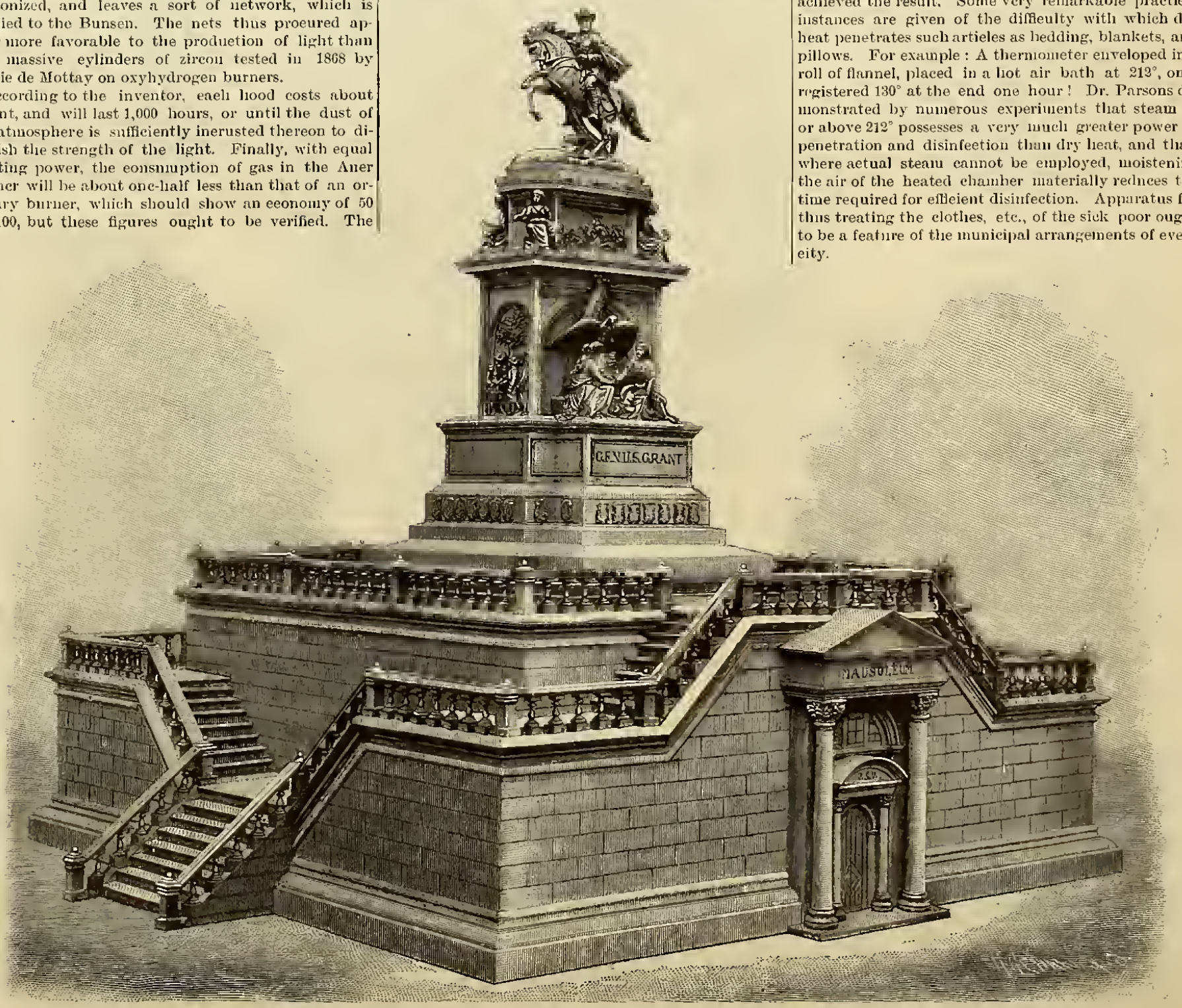
The monument is to be about 71 or 72 ft. high, the lower part consisting of a mausoleum. It will cost about half a million dollars. The memorial is crowned by an equestrian statue of Grant. This represents the General as commander, riding to battle on a rearing horse, his cloak flying, and his head turned to look back, while he points in the direction of the enemy with a field glass held in his right hand.

At the four corners of the cap or upper part are four female figures representing Peace and Prosperity, Industry and Invention, Commerce and the Marine, Statesmanship and Law. On the front is a battle scene, Grant with outstretched sword riding at the head of a column of infantry, while at the left the cannoneers are busy firing the guns. At the back of this upper part, the North and South are represented as engaged in a mortal hand to hand combat, and in the midst of the confusion of the battle rises the imposing figure of a commanding general of the Southern army.

The group in the middle part of the monument is specially well conceived; two female figures, the North and the South, grasp hands in token of eternal friendship. The North is represented as having beautiful classic features and wearing the Phrygian cap—she is laying the palm branch of peace on the shattered weapons of war; while the South is characterized by features of the Southern type and light clothing, the figure being partly nude—she is laying a laurel wreath at the feet of an eagle whose outstretched wings spread over the scene. The background of this principal group is filled with an architectural design of arches.

On the opposite side of this part of the monument is the figure of General Grant in uniform and fully equipped for war. He is seated with his left hand on his sword, and about him and on a staircase behind him are grouped the members of a negro family. The negress, on whose wrists the fetters are still visible, raises her hands to Grant, praying him to deliver her from slavery, while the negro tries to express his gratitude by pressing the General's hand, resting his left hand on the forearm of his deliverer. In the foreground a little negro boy is playing with the broken chains. The left face of this portion represents, in high relief, the scene under the memorable tree at Appomattox, where General Lee surrendered his sword to the victor Grant. In high relief, at the right, the artist has shown the steps of the White House at Washington. On the upper step Grant is taking the Presidential oath before Chief Justice Chase, while in the background stand Grant's predecessor, Johnson, and several Senators, as witnesses. The front of the principal part of the monument bears the inscription, "Gen. U. S. Grant." The coats of arms of the different States are arranged on the under socle.

The mausoleum, which is 59 feet in depth, is provided in front and at the back with three terraces. The cap of the monument, the main part of the mausoleum, the portals, and the balustrades are to be made of polished granite, the foundation of rough-hewn stone, and the figures and coats of arms of the best bronze. The completion of the work would require about five years. —*Illustrirte Zeitung.*



ECHTELER'S DESIGN FOR THE GRANT MONUMENT, NEW YORK.

Disinfection by Heat.

The disinfection of articles of clothing, and of dwellings, after infectious ailments, is admittedly one of the most important duties which attends the work of preventing disease. A recent report of the medical officer of the local government board, London, presents the entire question of the destruction of germ life in a new aspect, including, as it does, a memoir on disinfection by heat, from the pen of Dr. Parsons. The degree of dry heat necessary to kill the germs of diseases well known to be infectious was first investigated. The bacilli of splenic fever, for example, were killed by exposure for five minutes in a dry heat varying from 212° to 218° F., but their spores did not yield to two hours at 220°. One hour at 245°, and four hours at 220°, achieved the result. Some very remarkable practical instances are given of the difficulty with which dry heat penetrates such articles as bedding, blankets, and pillows. For example: A thermometer enveloped in a roll of flannel, placed in a hot air bath at 213°, only registered 130° at the end one hour! Dr. Parsons demonstrated by numerous experiments that steam at or above 212° possesses a very much greater power of penetration and disinfection than dry heat, and that, where actual steam cannot be employed, moistening the air of the heated chamber materially reduces the time required for efficient disinfection. Apparatus for thus treating the clothes, etc., of the sick poor ought to be a feature of the municipal arrangements of every city.

A PRETTY COTTAGE FOR $1,000.

The precise figures of the estimate for this picturesque and tasteful dwelling, as given by the designer, Prof. U. W. Hart, of New Haven, Conn., are $936.32. This must be regarded, of course, as the minimum price; and in carrying out the plans most persons, unless in especially favorable localities, will find it difficult to stop short of $1,200; but we put the figures at $1,000 as the least for which we should wish to undertake its erection for ourselves.

The entrance hall, not being large enough for a reception room, is placed on the side, where its front door and staircase are nearest to the work-room, and to the parlor as well. Under the front stairs are stairs that lead to the spacious cellar, which runs under the whole house. On entering into the kitchen, it will be found that it is both kitchen and pantry, and in the various closets surrounding will be found places for every article used in these two rooms, right where they are needed. Near the portable range is a closet for all the stove and iron mongery of the house. Between the kitchen and dining-room will be found, next the floor, three drawers for table linen, opening into the dining-room; next above is one drawer for spices, etc., opening into the kitchen, and close by the mixing table, which is in front of the window; and over this last drawer are shelves for dishes, opening from both kitchen and dining-room, and inclosed with doors on each side. At the left of the window is another inclosed closet for provisions of all kinds. Between the window and the door opening to the back of the house is a table inclosed below for the flour barrel. In this combined kitchen and pantry, all drawing out of the table and traveling to and from the pantry, bringing and returning the articles three times per day, is avoided

The little parlor of this house is intended to be the family sitting-room, and the kitchen and dining-room are so arranged that the family work can be done in them without observation. The dining-room communicates with both the other rooms in such a way that it will be warmed from them sufficiently for its proper use.

The second floor will be found to be planned with equal care. A small stove in the upper hall will add greatly to the comfort of all the chambers; and the hall, with its closet, will make a very convenient sewing-room. But those who wish can utilize this space for a bath-room. From this hall, stairs ascend over the other stairs, to a commodious store-room in the attic. Each of the three chambers is provided with a closet and two windows, thus securing good ventilation.

The height of the ceilings is 8½ feet in the clear in the first, and 8 feet in the second story.

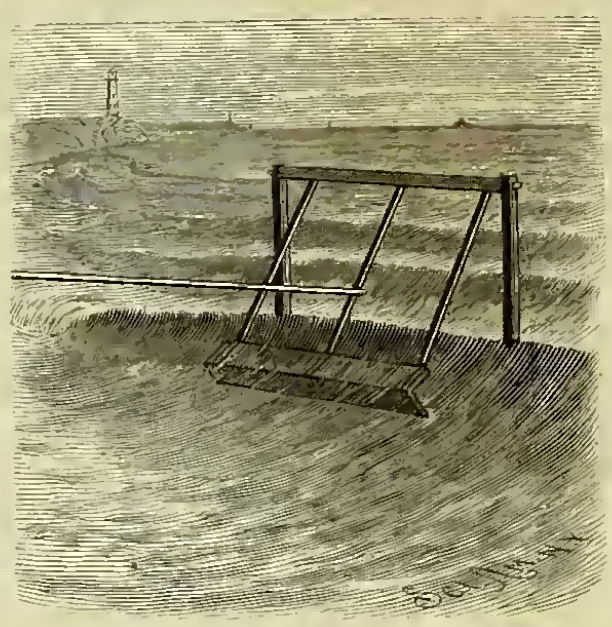
The purpose of this design, to state it briefly, is to make a home of which its occupants may be proud, even though it be situated in the midst of more pretentious and expensive neighbors.
—*Amer. Builder.*

STAINED WOODS.

Probably the most artistic and sensible craze that ever reigned among and over architects and their clients was that for the use of woods in their natural finish, but this has had its run. However, it took so deep a hold, perhaps because it was really artistic, the reaction is but slight, and there succeeds a craze for stains which extends to woods hitherto untouched by paint. The principal sufferer will be oak, the most durable and one of the handsomest of American woods. "Antique oak" embodies almost as much toadyism as a coat of arms, and is quite as repugnant to a refined American taste, for its use seeks to convey the idea that its possessors have an unbroken family record reaching so far back that age has stamped its impress upon their furnishings handed down from father to son in good old aristocratic style. Moreover, all such attempts at beautifying nature's most perfect workmanship are unsuccessful. We have become so accustomed to stained cherry, few know that this wood is not red, red as the setting sun, and certainly many architects do not appreciate the elegance of grain and color and marking shown in its natural state. The same is true of many other woods. Shall we not hope that the slight reaction manifest in the stain craze may be short lived, and the return to the beauty of the unadorned may mark an abandonment of all false methods and inaugurate a period of true artistic development among the people and their leaders in art?—*N. W. Architect.*

WAVES UTILIZED TO PUMP WATER.

I send herewith a description of a wave-operated force pump I constructed last summer, to supply my cottage with water, at Thousand Island Park, St. Lawrence River, N. Y. The water was delivered through a three-quarter inch pipe, 200 feet, with 40 feet elevation to tank. The power was obtained from the momentum of the waves, which proved ample.



HOW TO RUN A PUMP BY WAVE FORCE.

The first method by which I endeavored to obtain the power was by a float upon the water, which operated beautifully when detached, but when required to work, very little power was developed. I then hung a shaft, about six feet long, from supports anchored in cribwork, as shown in the sketch, and from the shaft suspended three arms, three feet long. Suspended from the end arms was a plank trough, six inches wide. Practically, the apparatus represented a six foot wheel, like the paddle wheel of a steamer, with barely one bucket, and that having a trough-like section. A cross arm at right angles projected from the central arm, to which was attached the pump. The incoming wave would impart its force or momentum to the swinging pendulum, carrying it much or little, according to the size. It was a surprise to see how small waves could do work; that is, little swells, which would swing the bucket but a few inches, would deliver a corresponding amount of water, frequently in drops rather than in a stream. Another lesson was learned by constructing the bucket eleven inches wide. At first, when a stream came sufficient to fill the bucket, there was not only a large waste of power, but great danger of destruction of the machine. Six inches proved to be the best width. For increase of power, increase in length is preferable. I am well aware that such apparatus might not be as practical as a windmill where heavy seas are liable to occur, as the construction of the piece to stand the shocks would be expensive. In this experiment the cost was not one-quarter that of a windmill, while the apparatus was out of sight. S. B. Palmer.

THE NEW ACADEMY OF ART IN MUNICH.

The new Royal Academy of Art in Munich, a splendid monument consecrated to the arts of peace, has lately been completed. In consequence of serious disputes between the Ministry and the Legislature, the money received as indemnity for the French war was withheld for a long time from the object for which it was to be expended; but finally, after a period of ten years had passed, the last scaffolding disappeared, and the newest monumental building of the Bavarian capital appeared in its imposing beauty. It is built in the noble style of the Italian Renaissance. The great architect Gottfried v. Neureuther created for himself a proud monument in this, which will probably be his last great work.

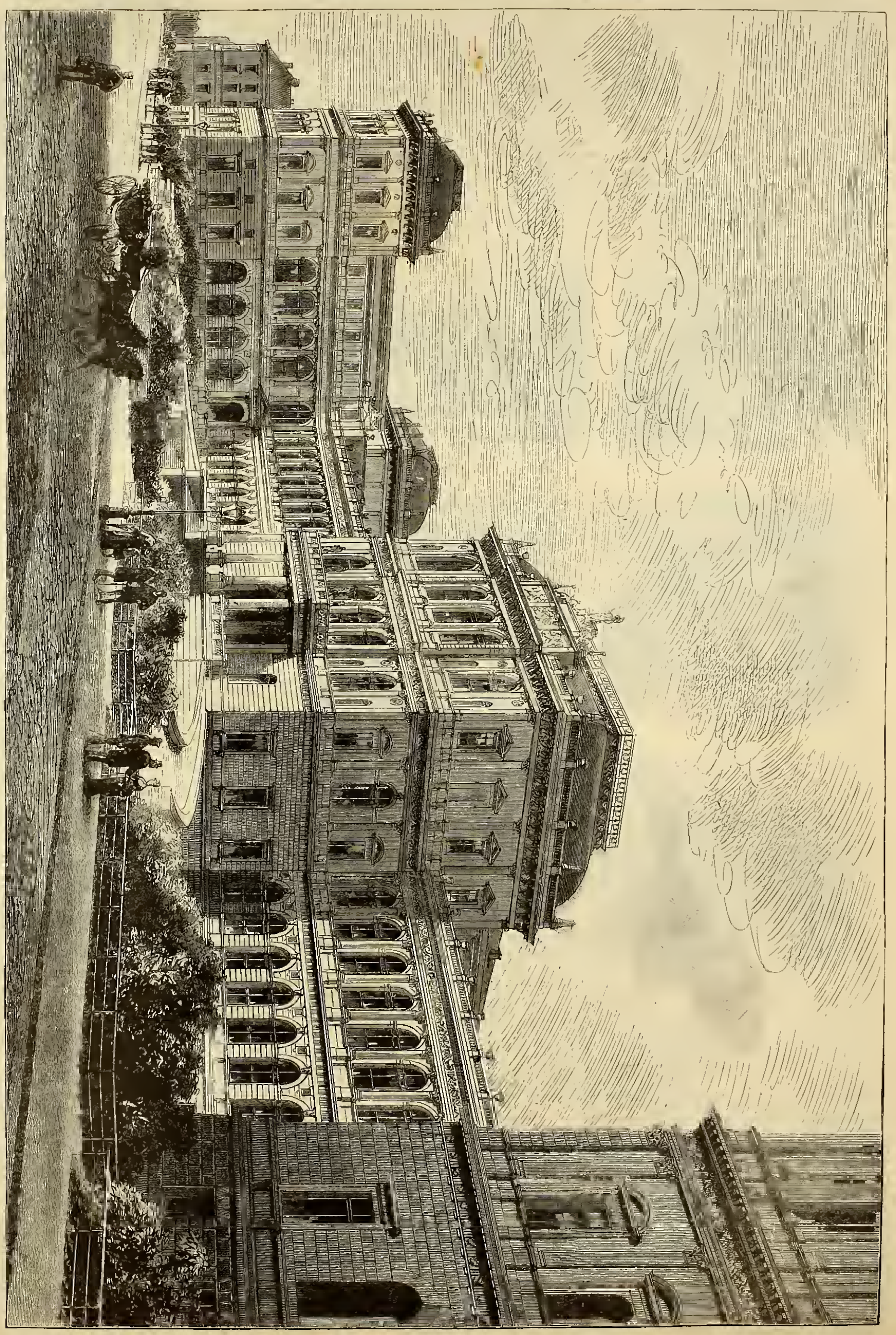
The choice of the site, on the north side of the city, near the triumphal arch, was, at first, considered unfortunate; but as the city has grown rapidly in this direction, all former fears that the Academy would be too remote have been removed.

Broad steps, flanked on the right and left by the ramp, lead to the portal of the middle building, which is richly ornamented by plastic groups. (Minerva crowns the building, and on either side of her are the allegorical figures of Poetry and Science.) The imposing staircase forms a worthy entrance to this cradle of Munich art. By the great door of the main building, as well as by the doors of the wings, the lofty first story is reached. This contains all the halls for sculpture, the beautiful antique hall, part of the preparatory school of the Academy, and the archives. An elegant staircase leads to the upper gallery, which sweeps along the entire extent of the building, forming an artistic perspective. Here most of the studios of the professors, the school for copper-plate engraving, the painting and composing classrooms, and the hall of architecture are located. The schools of the different masters, and the nature classrooms, are in the next higher story, in the pavilions, and even in the basement. This high school of art possesses no assembly and exhibition hall, unless we can apply that term to the council chamber of the college, on the first floor.

The erection of this beautiful building is due principally to the energy of Piloty. During almost the entire period of the directorship of the dead master, efforts were being made to obtain this much-wished-for home of art instruction. It is scarcely a year since the celebrated director, with the institution under his care, moved into the new rooms, where his uncompleted work, "The Death of Alexander the Great," was begun. To-day a younger man, with a name long known to artistic circles, F. Aug. v. Kaulbach, conducts the school.

The Munich Academy has a high place to fill; for it must prepare a new ground from which a fresh artistic life must spring. The disciples of art flock to the Munich school from all parts of the world, and carry its fame back with them. The accommodations of this palace of art already seem too limited to receive all the believers, and yet this Bavarian Mecca of artistic youth has only just been completed.—*Illustrirte Zeitung.*

A COTTAGE FOR $1,000.



THE NEW ACADEMY OF SCULPTURE AND PLASTIC ART, MUNICH.

ILLUSTRATIONS OF GERMAN COTTAGES.

The house is the embodiment of the sentiment of the people; and while city houses are, to a great extent, affected by the influence of foreign culture, in all countries—and especially in Germany—the national house is that of the present, for it is necessarily influenced by the conditions of the national agriculture and the village life. As the Germans have always, since the time of Tacitus, preferred country life, they take special interest in the architecture of the old German houses.

The dwellings of the old Germans described by Tacitus are easily recognized in the modern structures of North Germany. The German buildings were not separated by a court and garden, as were those of the Romans; the whole establishment was under one roof, and the house was partly dug out of the ground—as is still the case in some villages of Northern Germany—and there were steps leading down into the interior. Such houses (see Figs. 2 and 4) are still to be found in Westphalia, Hanover, Pomerania, Mecklenburg, and Schleswig-Holstein. In the Holstein house, the smoke arisng from the fire has to find its way out through the door, or penetrates the grain which fills the interior of the immense roof.

The Wendish house resembles that of Saxony. It has a smaller hall, in which the hearth is placed, but it is customary to arrange a large living room back of this, which is lighted by side windows at the expense of small rooms. This plan is also followed in the South German peasant houses. The entire establishment is under one roof, but the dwelling is separate from the barn and stable, which have their particular entrances. Any one who travels through the Black Forest will notice the houses with great interest. Sometimes they are sheltered in the valleys, where they seem almost colossal as they spread under their pyramid-like roofs; and again they appear on the slopes of the mountains,

1. Holstein Peasant House. 2. Westphalia and Saxony Peasant House. 3. Schleswig Peasant House. 4. Frank Peasant House. 5. Swiss Peasant House. 6. South Germany (Black Forest) Peasant House. 7. Further Pomerania Peasant House. 8. Thuringia-Frank Peasant House. 9. Wendish Peasant House.

Creeping of Varnish.

We often meet with this trouble, especially in light-colored gears, where oil has been used in the colors, and in almost every case where oil and varnish are combined in the varnish and color. One way to get over the difficulty is to give the job two coats of the true color, and then a light coat of pure varnish without any in; but when you cannot take the time for that, and are compelled to have your varnish and color strong, you can adopt the following two plans, which we have found have answered the purpose. As creeping is caused principally by sweating, which throws off from it instead of attracting to it, we must try and get rid of that false tack, which is nothing but a thin crust of oil held in its place by the other ingredients in the color, just as gold sizing standing over night exposed to sulphur from the stove will have a thin coating of sulphur; and although you might lay the gold on, and to all appearance it would be all right, yet if you attempted to wash it off, you would find the gold would leave solidly.

The oil in the color acts in conjunction with the varnish just the same; the oil, being lighter in body than the varnish, rises to the surface, and, although seemingly hard, has that false gloss and tack which must be taken away before you can proceed. Where you cannot with safety rub it off, without running the risk of marring the looks of the job, take castile soap, and, instead of rubbing it, wash it. It is best, if you can, to take each part separate, except when you are varnishing, which in that case involves the washing of the whole job at once. You should always wipe off the whole job at once. You should always wipe off with a medium damp chamois skin, one not too dry, so as to retain enough dampness to insure safety. Even after you have gone through the above, if, after all your trouble, you still find places that have probably been missed or slighted in the washing, and detect the creeping, just throw a little pure water into your varnish, stir up thoroughly, and proceed just as you would if you had no trouble. Sometimes the creeping will occur in spots, and can, in striping, be stopped by breathing heavily upon the place, running over it at once with the stripe.—*Carriage Monthly.*

ILLUSTRATIONS OF GERMAN PEASANTRY COTTAGES.

With the migration of the races began the contest between the styles of houses used by the different races. The various types of houses are shown in the accompanying cuts, taken from the latest edition of Meyer's "Conversations Lexikon." The form of house built by the Franks has gradually come to be that most used. In this style of house the interior is divided into different rooms, and the apartments for the people, the cattle, and the provisions are not grouped under one roof around a middle space where all kinds of work are done, as in the houses of other German races, but the various compartments are separated by partition walls, the stable and barn being provided with special entrances.

In the dwellings of Westphalia and Saxony, the housewife, from her central position by the hearth, or from her sleeping place back of the same, can keep her eye on her children and servants, her cattle and horses, watch the cellar, garret, and living room, and still go on with her spinning and cooking. Near the principal house are smaller houses for the field hands, the gardener, or the aged parents. These are built on the same plan as the larger house, but are smaller, to correspond with the lesser needs of the occupants.

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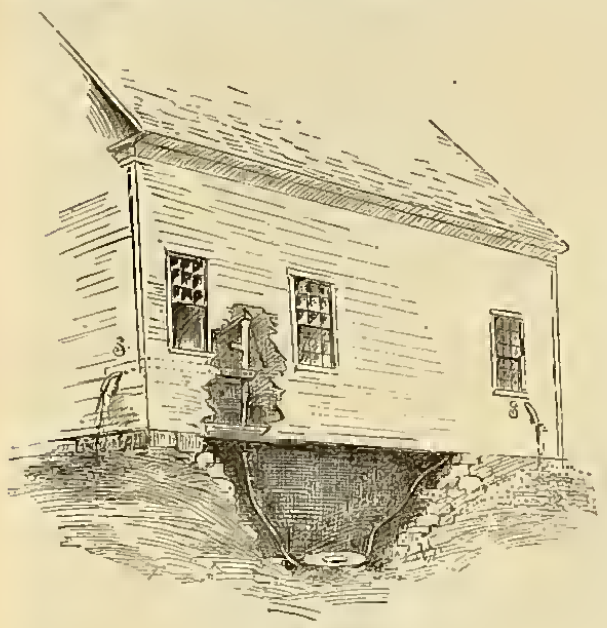
In several of the Swiss cantons, the same roof covers the dwelling, the stable, and the barn, but in these houses two stories are used for the dwelling. These stories are reached by outside stairs and corridors which are protected by the roof. In the Berne district, the kitchen is in the center, as in the Saxon houses; but in central Switzerland and in the mountainous districts the dwelling, stable, and barn are separate buildings. This use of separate buildings is also found in the Thuringen-Frankish houses, such as we see in Thuringen, Hesse, the Palatinate, and Rhenish Prussia. Here the buildings are arranged around a court which they completely inclose.

In upper Bavaria the stately and solitary buildings look like wooden fortresses, and, in fact, many of the mediæval castles of Southern Germany were built on the same plan as these peasant establishments.—*Illustrirte Zeitung.*

A FEVER HOUSE.

In the annual report of the New Hampshire State board of health for 1886, Dr. A. H. Taft, of Winchester, reports that on May 5, 1885, a lady patient gave birth to a son. Convalescence protracted. Child "brought up" on bottle; deranged condition of bowels from the first. Mother and child in a miserable condition for two months. Upon examination, the sink drains and the well were found to be separated by but about six feet of very porous earth, as may be seen in the illustration. The condition of both patients remained unimproved until the use of the water on the premises was discontinued, and this was brought about only by



A FEVER HOUSE.

calling the attention of the State board of health to the condition of affairs.—*Sanitary News.*

One Reason why Paint Chips off from around the Spokes in the Hubs.

We are often asked by parties who ought to know for themselves, why paint chips off of the hub and along the edges of the spokes. They claim that they have used the best material both in the leads and oils, and yet they have that trouble. We ourselves have often seen jobs that have been out but a short time, and all gone in spots; the trouble has been caused in nearly every case by carelessness: 1st, on the part of the wheelmaker who made them, and 2d, on the part of the painter or apprentice who primed the wheels. The wheelmaker was careless, because he failed to clean all the glue off when he drove the spokes. It does not answer the purpose to claim that he took his sponge and, dipping it into the warm water, washed it off. He did not get it off as thoroughly as he should. In using his sponge once or twice, he will find that he has thoroughly impregnated it with the glue, and instead of removing the glue he has merely spread a thin, almost invisible, skin over the hub. The wheel goes to the paint shop and then falls into hands of an apprentice to prime, and unless there should be an extra large piece adhering to the hub, he fails to see anything wrong, and without further investigation proceeds to cover the skin of glue with his oil priming. The wheel stands around quite a sufficient time to allow the priming to dry before it is ready to be finally painted, although the oil and lead has not been able to penetrate through the glue. He thinks because he can sand it off when he gets it, it is right. The wheel is finished and goes out into the weather. As soon as the dampness from any cause strikes through the paint, it loosens the skin of glue, and away goes the paint, especially if the job sees hard driving.

The remedy for all this is very simple. If the wheelmaker would use two sponges, instead of only one, when he washed the glue off, and have the second sponge used only in fresh water, apart from that which he has in the glue kettle, he would avoid all the trouble. The apprentice, or whoever primes them, should not take it for granted that, because it looks clean, and he cannot see anything out of the way with it, it is all right. That is where he makes his mistake. He should be thoroughly satisfied as to the proper condition of the job before he proceeds any further. In order to be so satisfied, he should carefully sandpaper the wheels all over, and especially between and around the tenons on the hub. He should examine his paper, and if any hard spots appear on the paper, with a smooth, glazed appearance, he may depend upon it that there is glue upon the hub, and should see that it is all removed. When his paper brings the wood away with it in a fine dust, he is then all right, and not before.

In regard to the edges of the spokes, that is principally caused by the party who brings the job up. For instance, if he has been in the habit of cutting his edges through every time he has prepared the job for a coat, and failed to oil the exposed places, the colors that are placed on top at those places have no foundation or anything to hold them, and, consequently, as soon as they are brought into contact with the atmosphere, they are quickly destroyed, the life dried out, and they are dropped off by friction through vibration in driving, or rubbed off through washing. The edges should never be cut through in the first place. There is no necessity for it if ordinary care is exercised, but if they are by any means exposed, they should always be rubbed over with a little pure oil. It is not particular about the oil drying before the next coat is placed on. That would take up too much time. The coat can be put on immediately afterward, without any danger, as it does not require the places to be soaked in the oil, only rubbed. It is never good policy to compel an apprentice to so hurry in priming as to slight the job to get it done. Better use a little extra time and do it right, than to meet with trouble afterward.—*Carriage Monthly.*

The Grindstone Industry.

A correspondent of the *Portland Transcript* gives a description of a visit to the Bay of Fundy and along its shores, where the grindstone quarries are located. The superintendent of the quarry says when the tide is out his men go down on the rocky shore and work out near the water. At low tide the men on the shore drill some holes in the ledge, put in powder, and blast out great pieces of rock. When the tide rises again, they float out some big logs and empty barrels over where the loosened rocks are. When the water goes down again, they fasten a big rock to the raft with heavy chains, so when the tide again rises it lifts up the raft and the rock with it. Then they tow it as near the shore as they can. If it is the right kind and size for a millstone, sometimes it is allowed to lie there until the workmen, with stone chisel and hammer, work it into proper shape. At other times, by means of a derrick, it is drawn out on the wharf. Then it is rolled on a track and hauled to the factory.

At the great stone factory the large piece of rock is placed on a carriage, and, with a saw similar to the up-and-down saw in a mill, the rock is sawed into great slabs of the right thickness for the grindstone. The saw does not have teeth, but wears its way through the rock with the aid of sand and water, which are continually poured on. Then the slabs are taken, a hole made in the center, the edges trimmed off with a chisel, and the whole placed on a kind of lathe, turning it until it is true and the edge smooth. A grindstone that "wabbles" is not worth much.

The rock from which grindstones are made is a kind of sandstone, and there is a great difference in the "grit," some being coarse and some fine. Often several different degrees of "grit" are found in the same quarry. There are many quarries along the shores of the Bay of Fundy. The reason stone is taken from under the water, when there are many quarries a little distance from the shore, is because the best stone comes from the bottom of the bay, where it is covered at high tide.

FOLDING STEP LADDER.

The accompanying cut represents a folding step ladder, opened and closed, made of hard wood and ingeniously bolted and braced in such a manner as to form a strong, complete, useful, and handy ladder.

RUSSELL'S FOLDING STEP LADDER.

When folded it occupies a space of only four inches, so that it may be put in the pantry or behind any door where it will be out of the way, and yet be within convenient reach, thus saving the trouble of searching the cellar and garret, and perhaps finding the ladder in the yard in a condition unfit to be brought in the house. This compactness is of advantage to dealers, owing to the small amount of space occupied and the low cost of transportation. When used by painters, it can easily be carried under the arm, and for use as an article of household furniture it can be converted into a very neat hall rack.

This invention has been patented by Mr. H. C Russell, of 240 Robert Street, Toronto, Canada.

THE WISTARIA.

(W. SINENSIS.)

How much a simple building may be beautified by a good climber is shown by our engraving of an old wistaria on a modest cottage, the office of Mr. Virgo's nursery. The tree was planted by Mr. Virgo nearly fifty years ago, and, judging from its vigor—for the engraving shows only half its extent—it seems to promise endurance for perhaps another half century. The crop of blossoms was this year not a very full one, as was the case with most of the wistarias in the district. In a year of good bloom the little house looks almost smothered with the pretty lilac bunches.—*The Garden.*

WISTARIA ON MR. VIRGO'S HOUSE, WONERSH, SURREY.

THE recent development of the Mount Lyell gold discovery bids fair to eclipse anything of the kind hitherto found in Tasmania, and even to rival the famed Mount Morgan of Queensland, the value of which is counted in millions. Mount Lyell is about seventeen miles northeast of Macquarie Harbor, on the west coast of Tasmania. Further prospecting has revealed to some extent the extraordinary richness of the deposit. It would appear at first sight to be a dike formation; but its exploration so far indicates that it is of hydrothermal origin, like the celebrated Mount Morgan mine. Several assays have been made, giving magnificent results. Three are known that were respectively at the rate of 164 ounces, 187 ounces, and 348 ounces to the ton.

THREE CITY HOUSES.

The block of city houses illustrated was designed by J. Averit Webster, architect, 110 E. 125th Street, New York city. They have been erected on the north side of 133d Street, between 5th and 6th Avenues, for James O'Kane, Esq. The fronts are rock-faced Connecticut brownstone to the parlor floor, and above Philadelphia pressed brick, with brownstone and terra cotta trimmings. The cornice is entirely of terra cotta.

While the judicious use of terra cotta has given an ornamental impress to the fronts, the most striking and pleasing features are found in the round-arched doorways and windows of the parlor floor, and the triple windows of the second and third floors. The windows with the stone balcony, in the middle house, not only please the eye from without, but make the room they light the pleasantest in the house; a room that will receive the full benefit of the sunshine, even in mid-winter.

Stained glass is employed in the windows of the front sufficient to give a pleasant effect, yet not to that extent that becomes tiresome to the eye. The front doors are of cherry and light oak, with carved panels. Moulded stained glass is substituted for the upper panels of the doors.

The interior is arranged in the following manner: Dining-room, 11x18, in front of basement; kitchen, 13x15, in rear. The remainder of the basement is occupied by stairway, pantry, closets, etc. The parlor floor contains two parlors and staircase hall. A bay window nine feet wide and four feet deep, the full height of the room, opens into and forms a part of the rear parlor. This room is provided with a butler's sink, and communicates with the kitchen by a dumbwaiter.

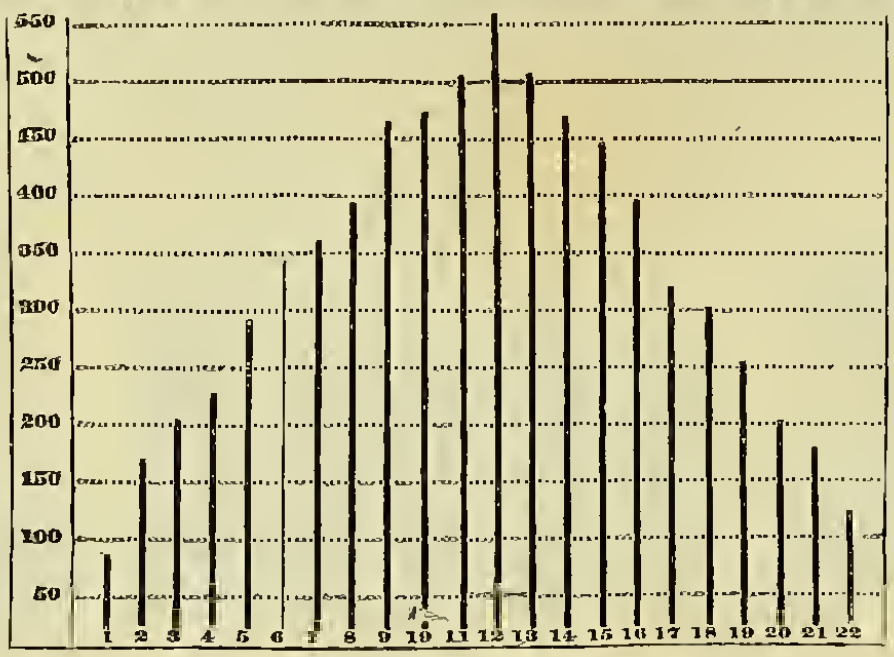
On the second floor are two large rooms (each with a separate dressing-room, provided with marble top washstand and ample wardrobes) and a bath-room. The middle house has three sleeping-rooms on the third floor, and each of the others four.

Dining-room, parlors, and entire second floor are trimmed in hardwood, kitchen in Georgia pine, and third floor in white pine.

The houses are heated throughout with brick-set furnaces, and the principal rooms are also supplied with open grates.

Each house is 16 ft. 8 in. wide by 40 feet deep. The basement is 8 ft. 4 in. high, the parlor floor 11 feet, second floor 10 feet, and third 9 ft. 6 in.

The cost is about $8,000 each house, exclusive of land.



1. Pompey's Pillar, near Alexandria, Egypt, 94 ft.
2. Niagara Falls, New York and Canada, 164 ft.
3. Cathedral (Minster) at York, Eng., 198 ft.
4. Bunker Hill Monument, near Boston, Mass., 221 ft.
5. Capitol at Washington, D. C., 287½ ft.
6. Bartholdi's Statue of Liberty Enlightening the World, 341 ft
7. St. Paul's Cathedral, London, Eng., 360 ft.
8. Cathedral at Antwerp, Belgium, 403 ft.
9. Great Pyramid at Gheezeh, in Egpyt, 460 ft.
10. Notre Dame Cathedral at Rouen, France, 470 ft.
11. Cathedral at Cologne, Germany, 510 ft.
12. Washington Monument, Washington, D. C., 555 ft.
13. Old St. Paul's Church, London, Eng., 598 ft.
14. Cathedral at Strassburg, Germany, 468 ft.
15. St. Peter's Church at Rome, Italy, 448 ft.
16. Cathedral at Freiberg, Germany, 385 ft.
17. Board of Trade Edifice, Chicago, Ill., 320 ft.
18. Big Trees, Calaveras Co., California, 300 to 330 ft.
19. Central Spire of Cathedral, Lichfield, Eng., 250 ft.
20. The Monument, London, Eng., 202 ft.
21. The Albert Memorial Monument, London, Eng., 180 ft.
22. Temple of the Sun, Cuzco, Peru, S. A., 120 ft.

HEIGHTS OF VARIOUS OBJECTS.

Sources of Dampness in Houses.

BY CHARLES F. WINGATE, S.B.

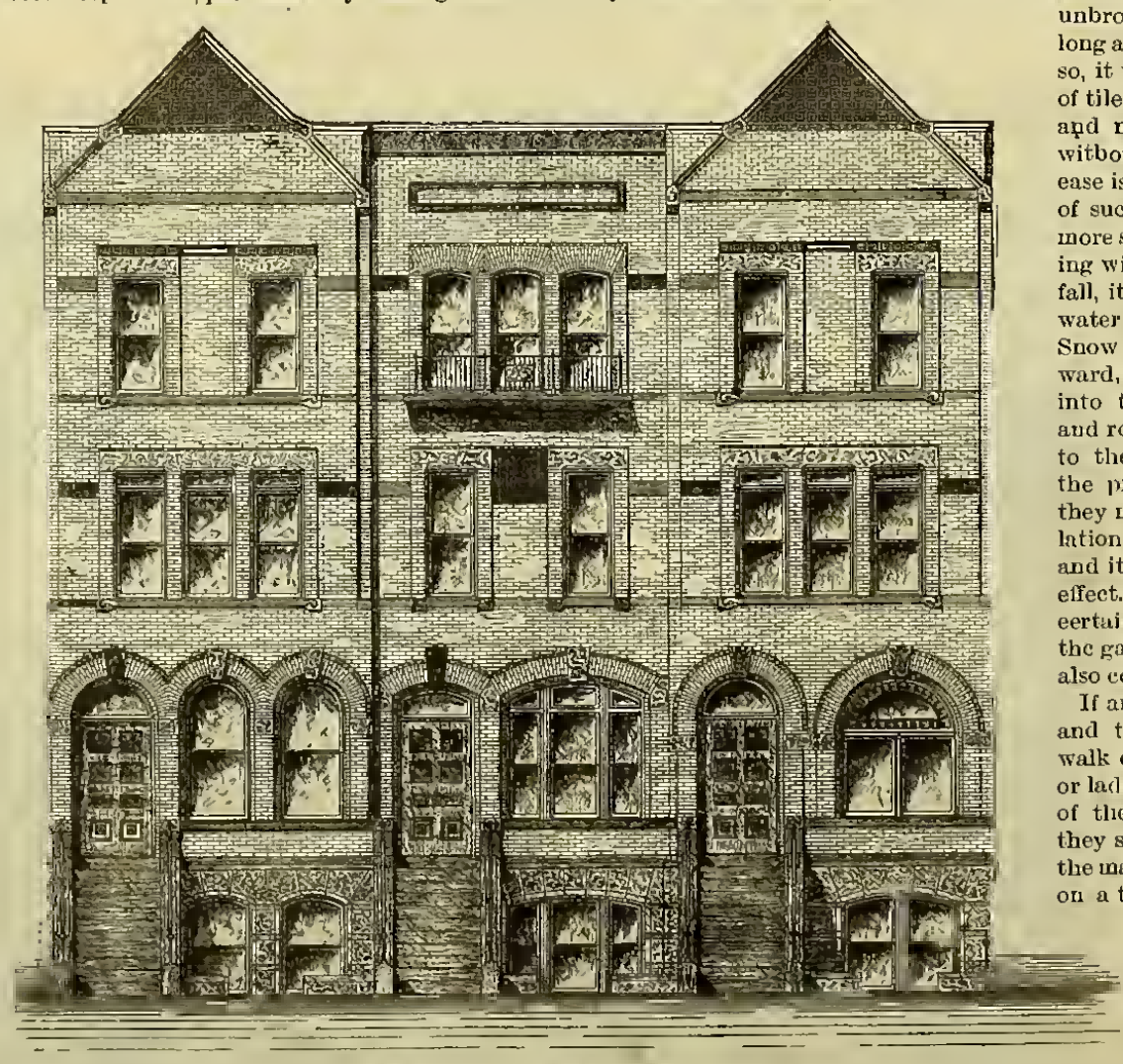
A dry house is, above all things, to be desired. Pure air, pure soil, and pure water are the three requirements for health laid down by Hippocrates, and if these could be provided in modern dwellings, the doctor's visits would be few and far between.

Dampness tends to contaminate the air of houses, the lung food of the occupants, and thus is doubly harmful. A host of diseases, such as consumption, rheumatism, catarrh, and bronchitis, are fostered by dampness of houses. What Frances Power Cobbe aptly terms the "little health of women" is chiefly due to this cause. They spend most of their lives within doors, and to a considerable extent on the lower floors, which are most affected by dampness, and they suffer much in consequence. If our houses could be erected on arches, as suggested by Dr. Richardson, the ills of humanity would be greatly lessened.

When a house is built of stone, the latter should be protected from dampness. All stone when new is more or less porous, and until it has become weathered it will absorb a great deal of moisture. An English architect says: "I invariably specify that stonework shall receive, when in a dry state, two coats of a solution, the effect of which is to render the surface of the stone comparatively impermeable, till such a time, at all events, as the stone has had time to weather, and form its own skin and natural protector. In fact, wax and gum are dissolved in a spirit, and the solution is applied with a brush on dry stonework. The spirit volatilizes, and the congealing of the rest forms a skin as thick as the stone is impregnated. Two coats are usually sufficient." Such protection is not so essential in our drier American climate, but in exposed localities, as at sea shores, it may be desirable.

Prof. Reclam, in order to secure healthful houses, recommends: 1. The mortar should not contain much sand, and should be made fresh from day to day. 2. No building with stone and mortar should be carried on in winter. 3. The stones used should never be dipped in water or lavishly soaked, but merely brushed over with a wet brush immediately before laying. 4. Partition walls should be filled up with some thoroughly dry material.

The "saltpetering" of brickwork can generally be prevented by adding linseed or any other oil to the mortar, at the rate of a gallon to the cask of lime. If cement is used in the mortar, an additional gallon of oil must be used for each cask of cement. The incrustation, once formed, can be removed by the use of hot water or muriatic acid, but it will reappear by exudation from the interior of the wall, and usually leaves a permanent black or brown stain.



A BLOCK OF THREE CITY HOUSES.

Projecting or "flush" window-sills, though considered æsthetic, absorb the rain through the brick joints, and permit water to drip upon the walls below. They are, therefore, highly objectionable.

An English sanitary authority says that dripping roofs are a very common cause of dampness in the soil in immediate contact with the walls of dwellings. Many a house without a basement floor, and otherwise dry and healthy, is rendered quite unfit for habitation from this cause. It will be frequently observed that the rain falling on the roofs of country mansions is allowed to drip upon and soak into the ground adjacent to their walls, owing to the absence of proper eaves-troughs, downpipes, and water-tight outlets; and if we examine the dwellings in most of our country towns and villages, it will be found that the same condition prevails with them even in a greater degree. It is in the absence of precautionary measures to secure a healthy base to the dwelling that "dry rot," which owes its name rather to the effect produced than to the cause, takes root. This much dreaded enemy is generated in a damp, close, and dark atmosphere; and when once in existence it seems to rise with extraordinary rapidity from its bed, and spread vigorously through timber and walls in all situations, dry or damp, light or dark. One of the requirements of the sanitary code drafted by Mr. Rogers Field, the eminent English engineer, should be adopted by every town. It is as follows: "Every person erecting a new building shall cause all rain water to be so drained or conveyed from the roof of any building as to prevent its dripping on the ground and causing dampness in the walls."

DEFECTIVE ROOFS.

Neglect of roofs is a prime cause of decay in buildings. A writer in the *London Builder* says that "Our roofing, as a rule, is probably in a more primitive condition than any other part of our buildings. If we compare the water-tight and durable protection of the ancient lead roofing to the shelter given by either tiles or slate, we shall see at once how much of the absolute weather-proof efficiency of the building is sacrificed to effect a money saving, which is, of course, a very considerable item. Neither tiles nor slates are laid so as to be absolutely water-tight. They lap over each other, so that in all parts of the roof there is, or ought to be, not less than two thicknesses of slate or an unbroken thickness of tile; and so long as rain falls vertically, or nearly so, it will run from edge to surface of tile after tile, or slate after slate, and make its way to the gutter without entering the roof. But the case is altered if we have anything of such weather as is frequent in more southern latitudes. If a swirling wind accompany a heavy rainfall, it will often carry a stream of water up over a portion of a roof. Snow at times makes its way upward, by the aid of drifting wind, into tiled roofs. Stucco, plaster, and rough cast are highly favorable to the retention of damp and to the progress of decay. Or, again, they may admit of a gentle percolation of water between the wall and its jacket, which has the same effect. The use of bricks made of certain kinds of clay, among which the gault has an evil prominence, is also conducive to damp.

If any repair is required in a roof, and the workmen are allowed to walk over it, unprotected by planks or ladders, the chances are in favor of their making two leaks while they stop one. The mere weight of the man, if allowed to come directly on a tile or slate, will very likely crack it. Again, a nail or peg left out, not to say a pick of a slater's hammer, is quite enough to lead to the sagging of the roof, and to the general increase of damp and advance of decay.

PRECAUTIONS AGAINST DRY ROT.

Besides taking precautions against dampness of foundations and soil, it is important to prevent possible dry rot in the timbers of a house. This may be accomplished by securing a thorough circulation of air around all woodwork, and by coating all the timbers which have to be buried in the earth with coal tar or

some similar substance. In a paper recently read before the Cryptogamic Society of Scotland, by Mr. Young, an architect of Perth, on "Dry Rot Fungus in Houses," he said: "1. Wood is necessary for the first production of the root of the fungus. 2. The wood after a time becomes exhausted of its nourishment for fungus, and when this is the case the plant attached to it dies. 3. Where other conditions are favorable, free ventilation is not against its growth; on the contrary, a draught aids it by dispersing its spores. 4. Upon good, perfectly dry, healthy wood it will not readily take root; but if it gets good root in dampish wood, its growth will ramify over fresh dry wood, and prey upon and destroy its tissues, thus ruining it for structural purposes. 5. The cure is to eradicate it as far as possible by burning the soil, applying a flame to the walls, removing every particle of wood from its locality, and by substituting stone, iron, or cement."

Dr. Wallace remarks: "It is a mistake to suppose, as many do, that dry rot attacks only the wood in the basement story. It is a common occurrence for the ends of joists built into porous stone to become affected by fungous vegetation; and it is frequently seen in pulling down old tenements that the ends of the joists are quite gone, and that for many years, probably, the joists have been resting only on the plaster cornices of the rooms. The remedy is the use of 'shoes' of glazed fire-clay or other material, which are built into the wall, and into which the ends of the joists are placed. The 'shoes' should be somewhat larger than the joists, which should be kept in position by little wedges of wood, so that air can play freely around the end of the joist. Such protected joists will last for hundreds of years, other circumstances being favorable."

Mineral solutions forced into the fibers of wood arrest the decay of timber by impeding decomposition by wet rot, and also prevent the growth of fungi. A weak solution of corrosive sublimate or of nitric acid has been found of service, after which the timber may be painted with white lead and oil. Timber such as wall plates, ground joists, and sleepers near the ground ought always to be creosoted or coated with a solution of coal tar and fish oil mixed with finely powdered clinkers from a forge. If the timber has not been seasoned, the solutions will not enter, the pores being previously occupied by the fermenting juices, and the process, therefore, will not be effectual. Again, if the joists of ground floors are not ventilated, it is of no use to apply remedial measures after the mischief has been done.

A practical method for ventilating the space under flooring is to construct channels under the floor leading to the kitchen chimney flue. These channels should be of porous materials, and should be six feet apart, and, by being carried to the kitchen chimney, the ground air will be drawn off with the heated air and smoke of the chimney. This was accidentally discovered by Dr. Renk, during his experiments at Munich. Being unable to account for the difference of ground air pressure in various parts of the basement upon which he was operating, he excavated the floor, and found that one of the air flues from the chemical laboratory passed under the basement floor to the foul air extract shaft, drawing with it the ground air in its immediate vicinity, thus relieving the pressure upon a certain area.

This arrangement I have found to work very satisfactorily in my own practice; but it is essential to have openings made at different points to admit fresh air from out doors, so as to cause a circulation, otherwise the flue will not draw. Cellars in most country dwellings are damp, and in many cases even wet. They are closely sealed in winter to exclude the cold, often by banking around the windows with stable manure, and rotting vegetables are stored in them until they become sources of danger. Many a typhoid epidemic has been traced to such places. I recently had the great satisfaction of breaking in the windows of an old farmhouse cellar which had not been opened in fifty years, even if they had ever been opened, and the change within, when the air began to circulate, was marvelous to the owners. Every one ought to remember that the cellars should have openings upon opposite sides in order to ventilate them. As this may not always be practicable, and if nothing better can be thought of, I would say, provide an elbow of sheet iron, cut a hole in the cellar ceiling, and carry the pipe through the side wall of the room above, so as to admit air from out doors, thus creating an inward current toward the opposite side of the cellar.—*Herald of Health.*

Sugar in Mortar.

To the Editor of the Scientific American:

On reading your article in December edition on "Sugar in Mortar," I am reminded of a circumstance I had entirely forgotten.

In 1861 my father was having an old country house remodeled. The outside walls required a removal of the plastering. By some means the plasterer had gotten behind with his work, and the painters were at his heels, so to speak, with the last coat of plaster not yet on. Desiring the plaster to dry very quickly, so as not to delay the painters, he mixed some common treacle in the plaster.

Those witnessing it ridiculed the procedure, but the plasterer averred he had frequently done it. It was painted the same day, and now, after twenty-five years, it adheres to the stone walls as firmly as ever.

J. P. H. SERVER.

Lansdale, Pa., December 24, 1886.

Frozen Boards.

A well informed lumberman vouches for the truth of the statement that frozen lumber occupies a smaller space than the best kiln or air dried; that is, that if two boards of the same size be taken green from the saw, one will contract more under the influence of extreme cold than the other will through any artificial drying. An instance of this character is thus stated: A gentleman, now old, remembers how his father determined to lay a floor; but the proprietor of the old-fashioned saw-mill on which the community depended for their lumber had no dry stock—nothing but green logs, which might be supposed to be frozen under the influence of the below-zero weather then prevailing. He was ordered to saw up those logs. The frozen lumber was taken just as it came from the saw, dressed off by hand, as usual in those days, and laid in the floor. Many years after, the son, who was a builder, put up a house for his own use, and built it as well as he knew how. He paid particular attention to the flooring, and himself superintended the kiln-drying of the strips. But in spite of all his care the floors shrank, and in a few years showed wide spaces between the boards. On the contrary, the floor his father laid of frozen lumber, after forty years of service, showed not a crack—a knife blade could not be inserted between the boards, and it had always retained its perfect surface. The story is an interesting one, as showing that woods have peculiarities which are understood by but few.—*Northwestern Lumberman.*

A BLOCK OF SIX CITY HOUSES AT JERSEY CITY N. J.

SIX CITY HOUSES.

Our illustration shows the elevations of six houses now in course of erection at the corner of Jersey Ave. and Eighth St., Jersey City, for Delavan De Long, Esq. The basement and stoops are brownstone, trimmings of terra cotta, stone, and galvanized iron. Each house is 16 ft. 8 in. x 36 ft. Kitchen and dining-room in basement. First floor has front and back parlor; second floor has two bed-rooms, bath-room, and closets; third floor has three bed-rooms and store-room, closets, and light shaft to bath-room. All inside finish with whitewood. The houses show a very fine appearance, all corbels and projections having a beautiful effect, each house being of different design. Cost, complete, of each house with all improvements, $5,000.

EDW. SIMON, *Architect.*

245 Washington St., Jersey City.

Culture of Asparagus.

Mr. Joseph Harris argues, in the *American Agriculturist*, that "the plants which contain comparatively little nitrogen require a 'sap of the soil,' rich, rather than poor, in nitrogen. Turnips contain comparatively little phosphates, and yet soluble phosphates are found of special value as a manure for turnips. Wheat and barley contain comparatively little nitrogen, while clover, peas, and beans contain a high proportion of nitrogen; and yet it is a well known fact that to produce a good crop of wheat or barley, the sap of the soil must be richer in nitrogen than for clover, peas, and beans."

It is convenient sometimes to mark our tools. This can easily be done as follows: First clean the place you wish to mark, and then cover it with a thin layer of beeswax, raising the edges so as to form a basin. Mark your name in the wax with a sharp instrument, cutting it through to the steel. When this is done, fill the basin with undiluted nitric acid, or aqua fortis, and let it stand a while. The longer it stands, the deeper it will cut. Then wash with water.

DISPENSARY AND RELIEF STATION AT BATTERSEA, LONDON.

This illustration shows the dispensary and relief station in connection with the Wandsworth and Clapham Union at Battersea. Mr. Thomas W. Aldwinckle is the architect.—*Building News.*

What a Western Farmer Saw in the East.

A Western farmer, who lately took a trip East, writes as follows to the *Country Gentleman:*

The first thing to impress me when going from the West to the East is the economy of land in the East. In the West, and even in Illinois, we give everything an abundance of space in which to grow. We often have, for example, the space of a rod between the crop and the fence. If the crop wants to spread itself, we propose to gratify it without straining the fence. The great fertility of our Western land may make this necessary, you know. Our orchard trees are planted wide apart. East they seem to be crowded against the buildings or against the fences. Many more ornamental trees have been planted in Illinois than in New York. Is this because land is so valuable in New York, or because our bare prairies make us love trees the more? But we might well learn of our Eastern brethren in the economy of land.

In one way, however, the Eastern farmers are wasteful of land: they make the fences as crooked as the ways of a politician—to suit some slight conformation of the ground, to avoid passing over a small brook, or what in some cases appeared to me could be only a desire to make the fence as crooked as possible. Now, geometry demonstrates that "a straight line is the shortest distance between two points." It would economize both fence and land to make the fences straight; and the fields would be easier of cultivation. Cross fences, at least, could be straightened. Where the boundaries of farms are crooked lines, why not cut off a rod here and a rod there, and make the boundary line straight? For that matter, while we are speaking of economy in fencing, why not have no fences, as in the West? The old common law was right; a man should fence his own stock in, and not all the world's out; and if this should now prevail, one-fifth of the fencing we now have would answer, and we would not at all be inconvenienced, either.

Shall I offend the pride of my Eastern readers if I say that Illinois has better farm dwellings than New York or Pennsylvania? It is true. Compare the best parts of the States, and we can beat you on houses. But you Easterners beat us on barns; and you beat us further than we beat you on houses. In barns and all outbuildings, you are far ahead of Illinois—of course, further ahead of Nebraska or Kansas. I like to look at the barns in the best part of New York or Pennsylvania, they are so large and substantial and neat. I believe the barns are neater and better kept than the dwellings. Not long since I visited an Illinois farmer who had his own waterworks and gasworks, having water and gas in all parts of his large and very handsome four-story brick and stone dwelling. His barns were large; but they were of boards, had never known paint, and there was litter and manure about them. I could not help but contrast them with the neat Eastern barns, in which I could see the cattle eating. Think of us, or a Nebraskan or a Kansan, putting cattle in a stable in summer! It would pay a Western farmer for the trip to go East and study only barns and stables. He would then realize how much feed he wastes, how much he loses by exposing his animals, and how much manure he might get on his land.

In the West much more farm machinery is used than in the East. It causes a Westerner to laugh to see small grain being cut with a "dropper" or a self-raking reaper; and he cannot refrain from laughing heartily when he sees grain being cut with a cradle. I do not think that one Nebraskan in a thousand would cut grain with a cradle; he would lose the grain first. Nothing short of a self-binder will answer; and then we put on five horses, and cut and bind twenty acres a day. Six years ago I cut 147 acres in one week, and didn't work in the dark or on Sunday either. True, I used ten horses, two sets of five, but that was because the ground was so soft I would mire down if I didn't drive fast, and several times did it anyhow.

We don't cover corn with a hoe. We plant from twenty to thirty acres a day with a self-dropping two-horse planter. We raise the hay on the wagon with horse power (but pile the hay out of doors, sad to say); ride when we plow or harrow, or plant or sow, or reap or bind; and thrash by steam. In great part this is because of our smooth, level land, free from stones and stumps—but in part because we are more enterprising. (Fact.) The Eastern farmers are more wedded to old ways. They look at a dollar longer before they spend it for some improvement, and likely put it back in their pocket when they have finished looking at it. Take the matter of tile draining, for illustration. When Ohio farmers found that it paid to tile-drain, they put down tile liberally. Now the craze has struck Illinois, and Illinois farmers are planting tile as they would corn.

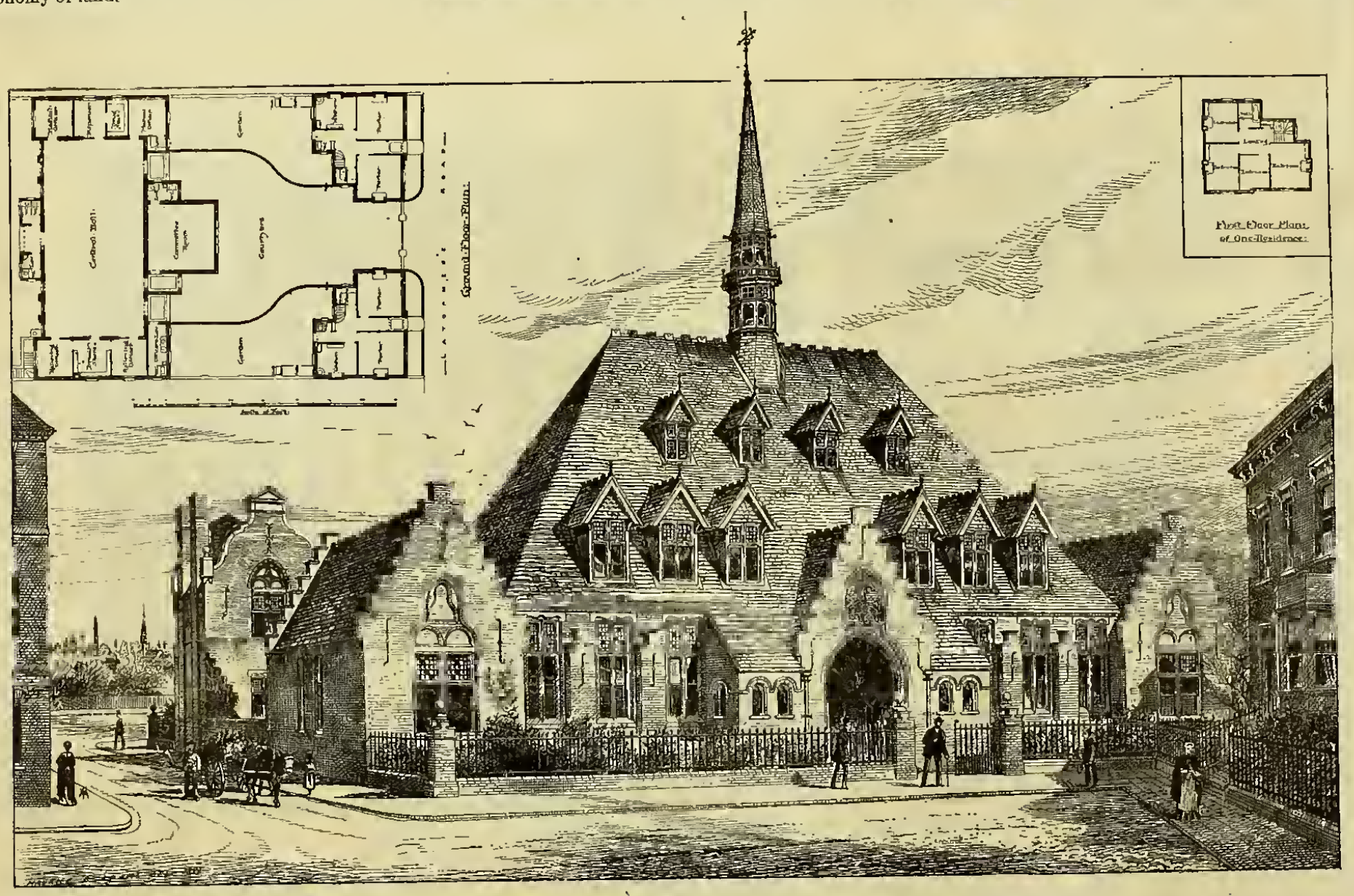
We have found it cheaper to make the wind pump our water than to do it ourselves; and the wind is doing a big lot of work of that sort. Get across the Missouri River, and a well without a wind pump above it is a curiosity. The wind kicks over the traces sometimes, and distributes houses and cattle around in a very annoying manner; but generally it works well and boards itself. My Eastern readers may claim all the credit for Western enterprise by saying that Westerners are emigrants, or descendants of emigrants, from the East. This is about true. The man that pulls up stakes in the East and goes out to Kansas or Nebraska must have considerable enterprise and go-aheaditiveness. And this does more than crop out in his new home—it expands.

I find that a great many Eastern people fancy that we raise mostly scrub cattle in the West. A trip West would change their notion. One of the surprises to me when I made my Eastern trip was that the cattle in New York were no better than the cattle in Illinois. I expected to find them better. Taken as a whole, New York has better dairy cattle than we, though Illinois has as good dairy cattle as any. In beef cattle we are ahead of the East—further ahead than they are of us in dairy cattle. In the West the cattle are not quite so good as in this middle territory; but there the scarcity of cattle is more apparent than the poor quality. And this is true of all stock. Even the ranchmen are now using full-blood males, some ranch owners buying Hereford, or Short-Horn, or Polled-Angus bulls by the hundred. You care for your farm animals far better East than the Westerners do—better than we do. This is not because of our ignorance or cruelty, but because many in the central part, and nearly all in the West, are paying for their land yet, and good barns and stables will come as soon as we can get to them. But observation, and especially conversation with those farmers who get on the trains, convinces me that raising scrubs can be set down against the East rather than against the middle section, or even the West.

We farmers should travel more. The Westerner can learn much of the Easterner, and the Easterner can learn just as much of the Westerner. The Westerner will be impressed that the *forte* of the Easterner is to save; the Easterner will think that the *forte* of the Westerner is to make. If the enterprise of the one could be combined with the economy of the other, both would be richer. If the Westerner goes East expecting to find every farmer highly intelligent, as I did, he will be fooled. If the Easterner goes West expecting to find every person ignorant, he will be worse fooled. No State in the Union can show more college graduates to the square inch than Kansas. There is more planting in the moon in the East than in the West, and more coins put away in socks; but in the West we are apt to spread our planting over eighty acres of earth when it should be only forty, and to buy land when we have nothing in our socks but holes.

John M. Stahl.

Quincy, Ill.

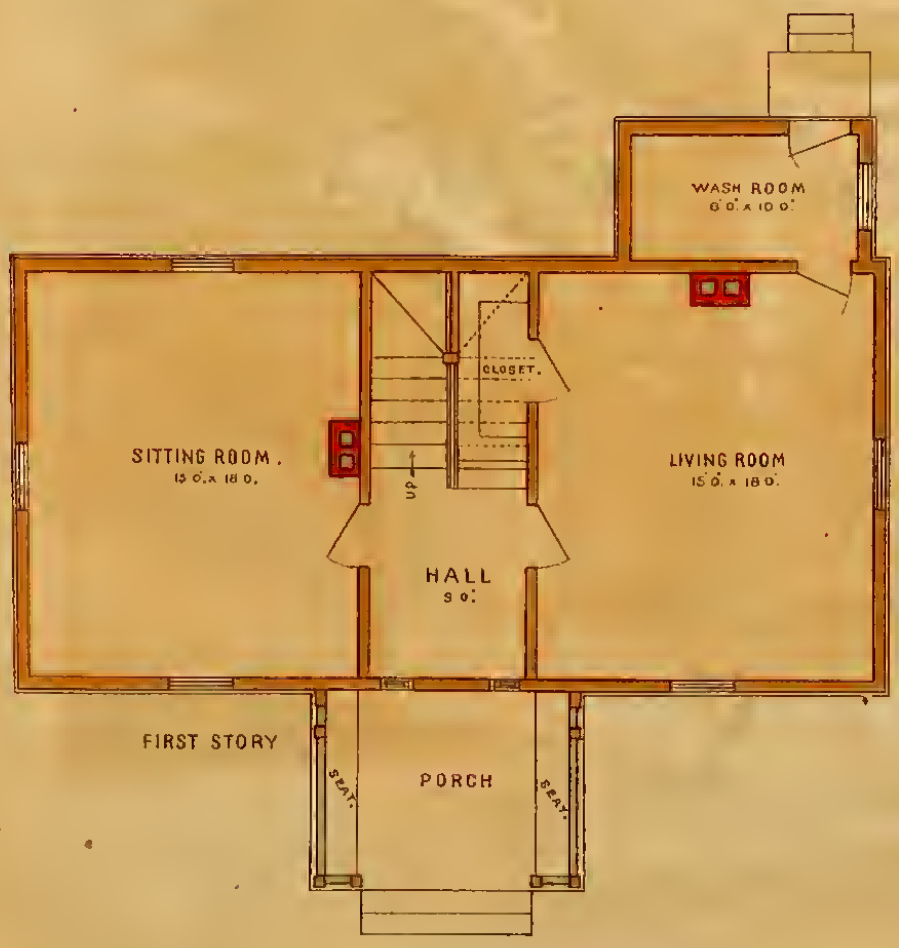


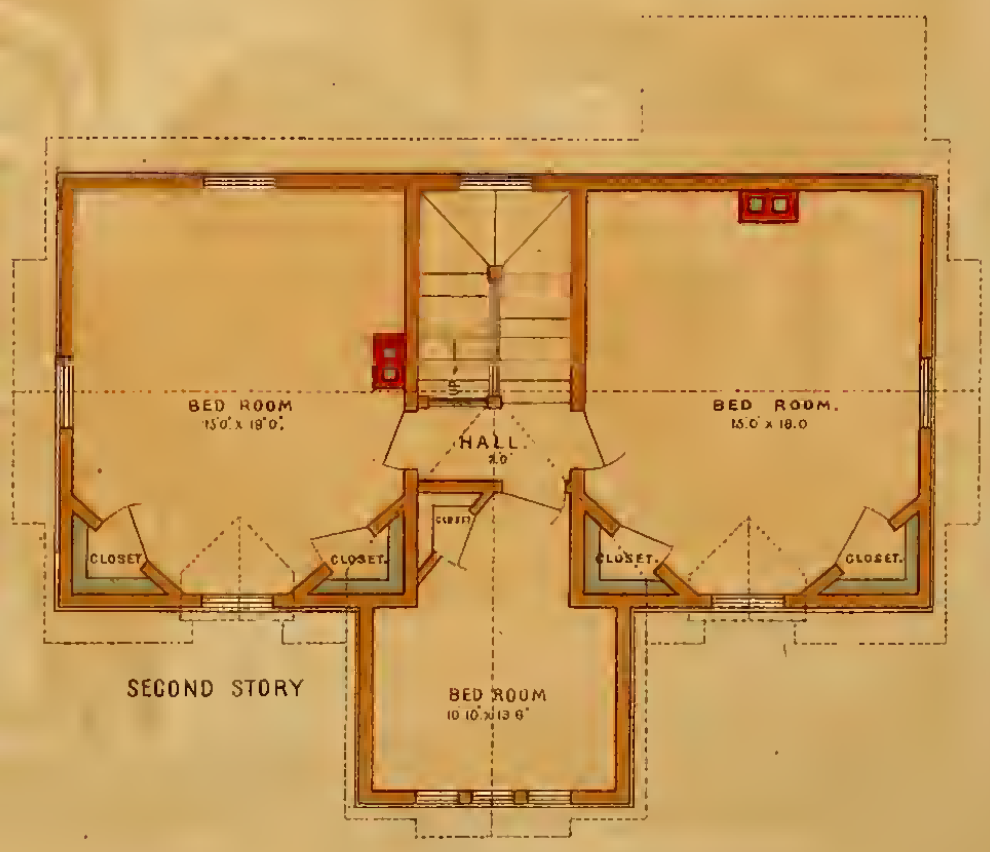
THE BATTERSEA DISPENSARY AND RELIEF STATION.

Wind pressure is generally supposed to increase as the square of the velocity when the opposing surface is at right angles to the direction of the wind, and in such cases Smeaton's rule is to divide the square of the velocity in miles per hour by 200; the quotient is the pressure in pounds per square foot.

THE FARRAGUT CLUB HOUSE, CHICAGO. ROB. RAE, JR. Architect.

A SIXTEEN HUNDRED DOLLAR COTTAGE. Wm H. BEERS, Architect.





SCHUMACHER & ETTLINGER, NEW YORK.

Destruction by Nitro-glycerine Explosions.

An "old oil operator" in the Bradford oil region thus rehearses in the New York *Times* some facts as to glycerine explosions which are certainly mysterious, and have been observed many times:

"Attending the frightful deaths that so frequently follow the handling of nitro-glycerine in the oil regions, there is one feature the mysterious nature of which is startling. It has puzzled scientific observation and study, and I do not believe to-day that any satisfactory explanation can be given of it. This singular feature is the almost complete annihilation of matter, especially of the human body, which in a majority of cases results from a fatal explosion of this compound. I have noticed that in many instances. I had a teamster in our employ once named Henry France. Like all men of his kind in the oil country, there was nothing either above, below, or on the earth that he feared. He was in the habit of carting nitro-glycerine to any well where I wanted to use it, and he and his partner Warren Jack actually got so reckless in handling the deadly stuff that no other help I had would remain at work when they knew France and Jack were coming in with a load of glycerine. These two men were so callous to fear that they used to unload the stuff as they would a load of bricks, France standing in the wagon and throwing a can to Jack, who stood some feet away, and Jack catching it and placing it on the ground in time to catch the next one his companion tossed him.

"As it takes a man with a good set of nerves to even ride in a wagon when he knows there is nitro-glycerine under the seat, this manner of handling a compound that the slightest jar frequently explodes will give an idea of the sort of nerves these two men had. One day in 1880 France was coming in with a load of glycerine, and when he was within a quarter of a mile of the well we heard an explosion. No one ever knew how it happened, but it was one of the most complete cases of nitro-glycerine annihilation I ever saw. We found the usual cellar that a few cans of glycerine always digs in the ground when it goes off, and the usual area of timber felled. Over 300 ft. off in the woods, to the right of the road, we picked up a wagon tire. We found the tail of one horse and the hoof of another. In another part of the woods a man's knee was picked up, and that was all we ever found, except Henry Francee's greasy cap lying by the side of a stump and his silver watch hanging on the limb of a tree.

"George Doran was blown to pieces by a nitro-glycerine explosion at Red Rock a few years ago. He was a man that weighed 200 pounds. All that the most thorough search ever recovered of that 200 pounds of flesh and bone was a part of one of the poor man's feet—less than one pound. Charles Berridge, a well known oil man, was blown up by nitro-glycerine one winter in Allegheny County. The ground was covered with newly fallen snow. On either side was a high and abrupt hill only a few rods apart. Berridge was a very tall man, and his weight was 180 pounds. The remains of the poor fellow were searched for carefully, but less than 15 pounds of them could be found. The most curious part of the case, and one showing how completely annihilation accompanies an explosion of nitro-glycerine, was this: The greatest force of the explosive is always expended upward. However infinitesimal the atoms to which Berridge's body might have been reduced by this explosion, in falling back upon that spotless snow some trace of them must have been seen, but the snow remained as spotless as before. Besides human bodies, the iron frames of wagons, and even the ponderous nitro-glycerine safes, have been removed from human vision by an explosion as effectually as if they had never been formed, and the mystery of their utter annihilation cannot be explained."

The Great Question of the Day.

The late Dr. Samuel D. Gross used the following words in an address delivered at the dedication of the McDowell monument: "Young men of America, listen to the voice of one who has grown old in his profession, and who will probably never address you again, as he utters a parting word of advice. The great question of the day is not this operation or that, not ovariotomy or lithotomy, or hip joint amputation, which have reflected so much glory upon American medicine, but preventive medicine, the hygiene of our persons, our dwellings, our streets—in a word, our surroundings, whatever or wherever they may be, whether in city, town, hamlet, or country; and the establishment of efficient town and State boards of health, through whose agency we shall be more able to prevent the origin and fatal effects of what are known as the zymotic or preventible diseases, which carry so much woe and sorrow into our families, and often sweep like hurricanes over the earth, destroying millions of human lives in an incredibly short time. The day has arrived when the people must be aroused to a deeper and more earnest sense of the people's welfare, and suitable measures adopted for the protection, as well as for the better development, of their physical, moral, and intellectual powers. This is the great problem of the day—the question which you, as representatives of the rising generation of physicians, should urge, in season and out of season, upon the attention of your fellow-citizens; the question which, above and beyond all others, should engage your most serious thoughts and elicit your most earnest co-operation. When this great object shall be attained, when man shall be able to prevent disease, and to reach with little or no suffering his threescore years and ten, so graphically described by the Psalmist, then, and not till then, will the world be a paradise."

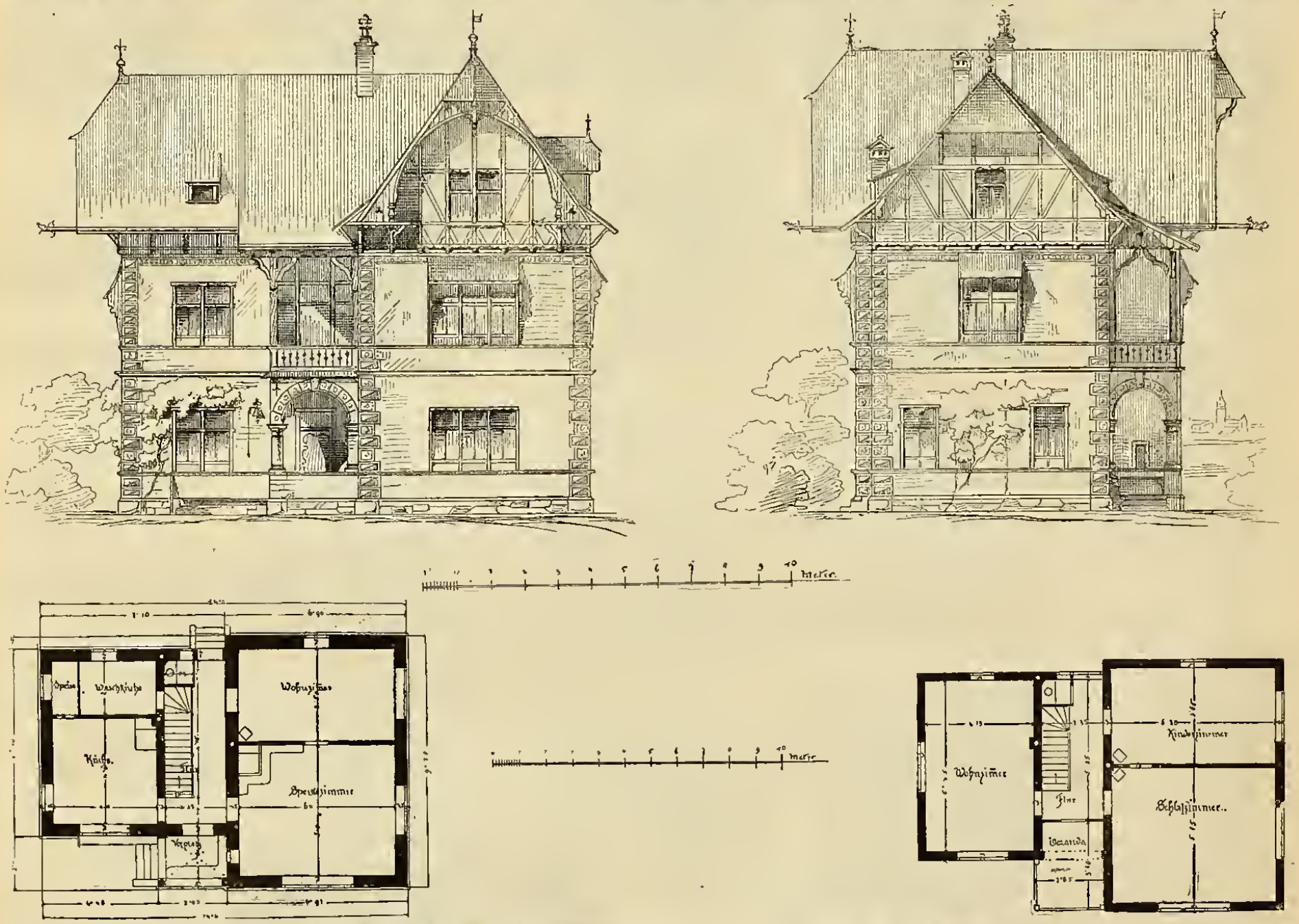
Lightning Melts a Lead Water Pipe.

Through the courtesy of Mr. W. F. Stewart, of Hermitage, Pa., we have received an account of the melting by lightning of a lead water pipe on the place of Mr. R. H. Abbey, of Corry, Pa. Water is brought to the buildings from a spring, 80 rods distant, through a lead pipe of half inch bore, at a depth of two feet. Water ceased running about the middle of last May, just after a thunderstorm, and all attempts to force it through failed. In September, Mr. Abbey dug down and found the difficulty to be some 15 rods from the spring, where a section of pipe, 3 or 4 inches long, was found to be melted and fused, so as to be nearly solid. This was cut out and new pipe put in, but still the water failed to run.

Two other melted sections, but not so completely as the first, were found, one about 7 feet above and the other 6 feet below the first. When these had been replaced, a full stream was obtained at the barn. On the west side of the pipe, opposite where it had been melted, the turf had been torn up for a distance of 30 feet or more, and from 1 to 2 feet wide and 6 to 8 inches deep. About 8 feet from the pipe this had forked, one part extending to the middle and the other to the upper fused point. This disturbance had been noticed at the time the water stopped flowing, and "consequently," Mr. Abbey concludes, "when I found the fused pipe, I was satisfied it was the work of lightning."

The New Water Tunnel, Chicago.

The work on the new lake tunnel at Chicago is progressing rapidly. The men work in three shifts, of eight hours each. The first dig the hole about 10 ft. in diameter, through clay, at the rate of about 18 ft. per day, the second trim it up and wall with planks, and the third lay a circular wall of bricks in cement, 12 in. thick. The tunnel is left a shade over 7 ft. in diameter, the whole plastered with cement. This will be completed in about five weeks, and the whole work in about three months.



AN AUSTRIAN COUNTRY HOUSE.—BY L. THEYER, ARCHITECT, BOZEN.

Hints for Builders.

The architects and builders of a thousand years or more seemed to recognize the peculiar construction of the eye and its ability to take in round objects better than square, and, no matter whether they understood this delusion or optical principle or not, it was apparently applied to all their public buildings and rooms of state. Though some of their specimens of architecture baffle the best engineering skill of the present age, these secrets were not buried beneath the ruins of Baalbec, Herculaneum, or Pompeii.

It may be that the massive stones in some of their large temples were put in place by some mechanical contrivances unknown in modern times; or it may be that large hills once occupied their temple sites, and the stones placed one above another, as we build a cellar wall, and when the structure was completed underground, the hill was razed and the edifice appeared in all its architectural beauty and simplicity, appearing, as it were, in a single night, a masterpiece to excite the wonder and admiration of generations countless centuries afterward.

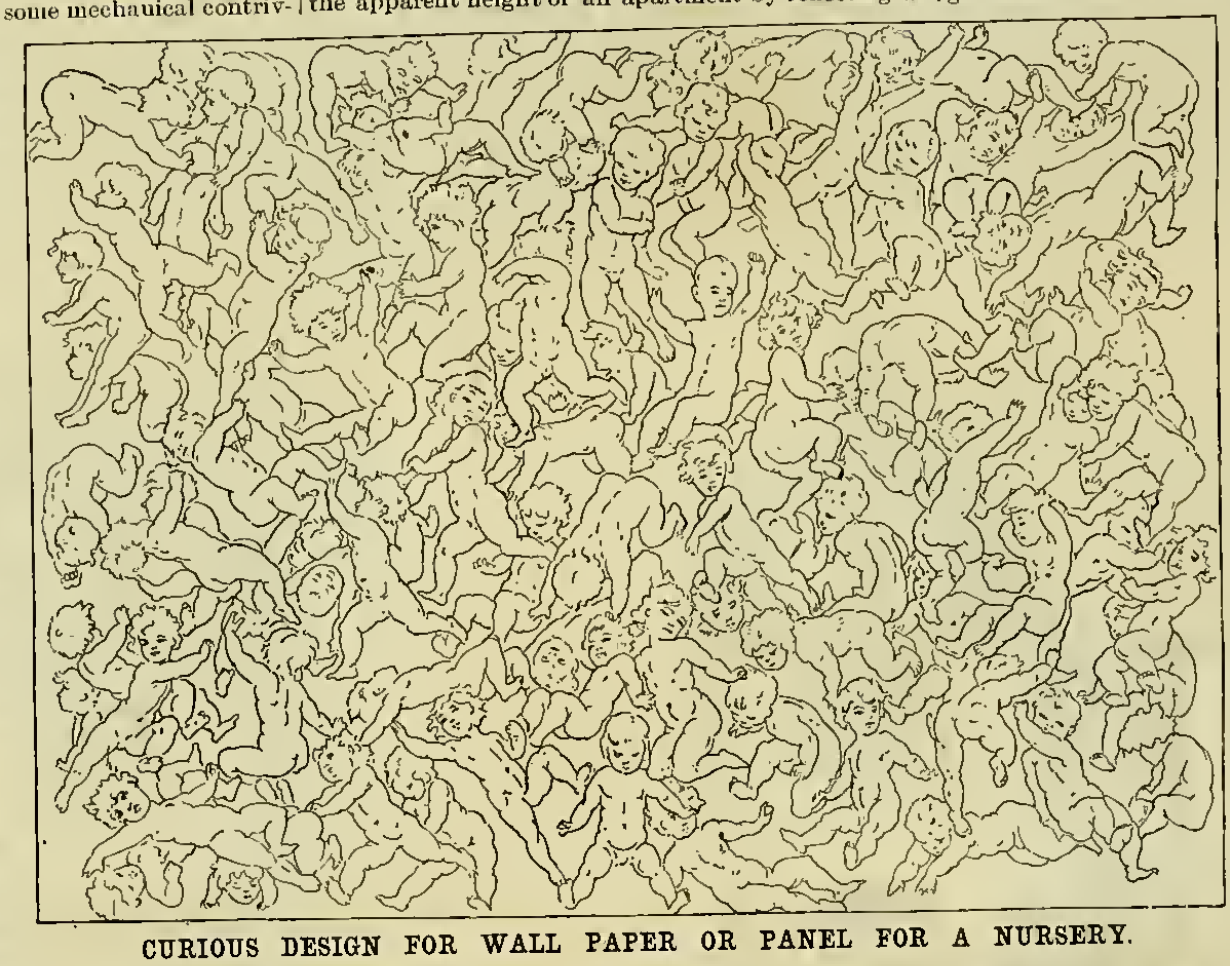
But the external appearances of their structures were by no means the only features that deceived the eye, and were intended to so deceive. The writer has stood in some rooms, in old temples, that the apparent size would stagger belief; and in others very small as measured with the eye would be small and still have so many outside walls, showing them to be very much larger than one would estimate. On the other hand, the large room would not be half so large as it looked to be, and the smaller twice its apparent size. These people disguised distances by curves, domes and alcoves; even a slope of but three inches of the floor toward the center, with a corresponding elevation of the ceiling center, made a difference of as many feet in the apparent height.

These principles are of easy application in modern buildings. To make a room appear higher, the plain surface of the ceiling should be decreased by the mouldings of the cornice, by panels, or, in the absence of these, by bands of color performing the same office. A vertical system of line should be adopted in mural decoration, and the mantel should be lower.

Then, to make a room appear lower, precisely the opposite treatment should be adopted; that is, to increase the plain ceiling, adopt a horizontal system of mural decoration, with a dado and a high mantel. To make a room appear wider may be accomplished by making it appear lower; but where this is undesirable, or where it is insufficient, the effect can be reached by adopting a mural decoration on a graduated scale of form, decreasing upward, so that two or more patterns at the top similar to those at the foot are found to occupy the same space as one at the foot, and this effect can be much increased by a gradation of color upward from dark to light.

To make a room appear narrower is accomplished by making it appear higher; but in case enough deception cannot be produced in this way, the same effect can be obtained by adopting a strongly drawn, large pattern in strong color for mural decoration. To make a room appear longer is accomplished by making it appear lower and narrower, and the effect is increased by decreasing the scale and strength of color of the mural decorations adopted at the ends. To make a room appear shorter is accomplished by making it appear wider and higher, and the same effect can be reached by increasing the scale and strength of color of the mural decorations adopted at the ends.

Any of the foregoing can be modified or increased by treatment of the floor surface, whether by carpets, rugs, painted boards, or the parquet flooring; lines running across a room, or rugs laid down at intervals, having the effect of shortening, and to an extent of heightening and widening a room, consequently lines running in the length increase this dimension, and to an extent reduce the height and width. A floor polished increases the apparent height of an apartment by reflecting all vertical lines and prolonging them.—*J. F. E., St. Louis Miller.*



CURIOUS DESIGN FOR WALL PAPER OR PANEL FOR A NURSERY.

THE CULTURE OF FUCHSIAS.

Lovers of flowers will perhaps be interested in the accompanying engravings, reproduced from photographs representing some fuchsias of unusual forms and dimensions raised by an amateur florist at Evreux. These fuchsias are the ornament of the garden, and are admired by connoisseurs as much for the vigor of their growth as for the abundance and beauty of their flowers. Fig. 1 represents one of these shrubs in its fourth year, and one whose flat, dome-shaped head, two yards in diameter, is large enough to allow several persons to take advantage of its shade. Seated under this plant, one can converse or refresh himself, as is shown by the objects reproduced in the cut, which serve at the same time to well establish the dimensions of this exceptional specimen.

In Fig. 2, three other fuchsias are grouped, the tallest of which is 14 ft. in height. This plant is six years old, and the others four

It is extremely rare to obtain such specimens of a plant which scarcely exceeds three feet in height in ordinary cultivation. The arrangements represented herewith are very pleasing and decorative, and might be oftener adopted by amateurs in horticulture.

The fuchsia is admirably adapted for the decoration of gardens. The elegance of its form, the lovely aspect of its flowers and their duration, and the little care that its culture requires should contribute to recommend it still further to the attention of landscape gardeners. In 1845, Mr. G. Porcher, president of the Orleans Horticultural Society, published a learned monograph upon fuchsias in an interesting volume which was soon out of print. A second edition of the work appeared in 1848, and to this the author added an enumeration of 738 species and varieties of the plant. We should add that since that period the list has considerably increased, thanks to the science of our horticulturists and to the zeal of amateurs, who are much more numerous than is usually thought.—*La Nature.*

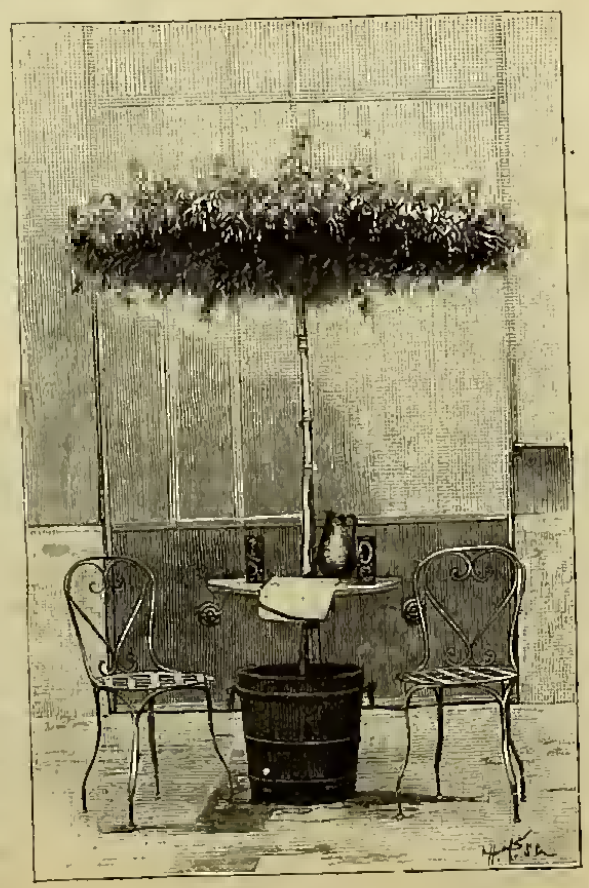


Fig. 1.

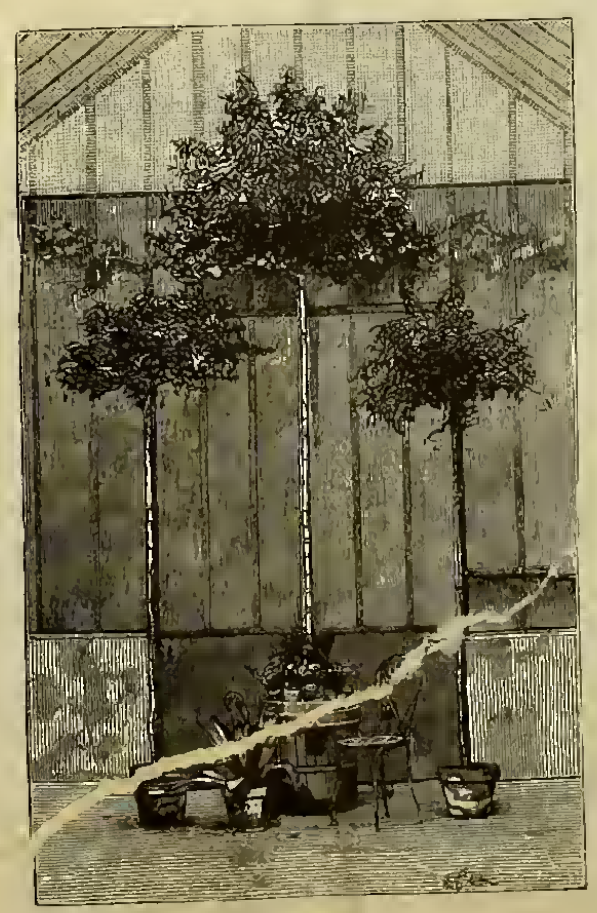


Fig. 2.

SHRUBBY FUCHSIAS.

Ivy in Hanging Baskets.

Among the very best plants for filling wire baskets that are hung up in corridors, verandas, and other exposed places all the year round are some of the many beautiful varieties of ivy, especially those with very small foliage and graceful trailing shoots. Some years ago I was very much pleased with the excellent effect produced by means of the common English ivy alone, that an amateur friend used to employ in a great variety of ways, for decoration, and especially for filling hanging baskets both indoors and out, the windows being draped with elegant shoots from plants growing in the smallest possible root space. Since that time I have employed ivies for baskets, for brackets, and balconies, and with excellent effect. Any one who has not tried them can have little idea of the variety of form and color to be found among these common hardy plants, and the smaller the root space the better do they display their variegation. The golden blotched variety, that only produces a few golden leaves at wide intervals apart when planted in rich soil, becomes beautifully variegated when starved at the root, and some of the silver variegated sorts are equally interesting. The large leaved kind called Hedera maculata, that in rich soil assumes a dull white variegation, is very much improved by basket culture, and the best of such hardy subjects is that they impart a cheerful look to a dwelling house at a time when other less hardy plants need the shelter of heated glass structures. For lining the base of hanging baskets nothing is equal to the stonecrops. They look fresh and green at all times of the year, except when covered with white or yellow flowers.—*J. G., Hants, in The Garden.*

To copper small pieces of sheet iron: Clean the article thoroughly by treatment in a bath of muriatic acid 1 part, water 4 parts, to remove all scale. Wash in hot water and tumble in sawdust wet with a solution of sulphate of copper in water, to which add as much sulphuric acid as is equal to the weight of the dry sulphate of copper. Use about 2 ounces of each to a gallon of water. You may also copper work that cannot be easily tumbled by dipping in the above solution hot. The work must be clean and free from grease.

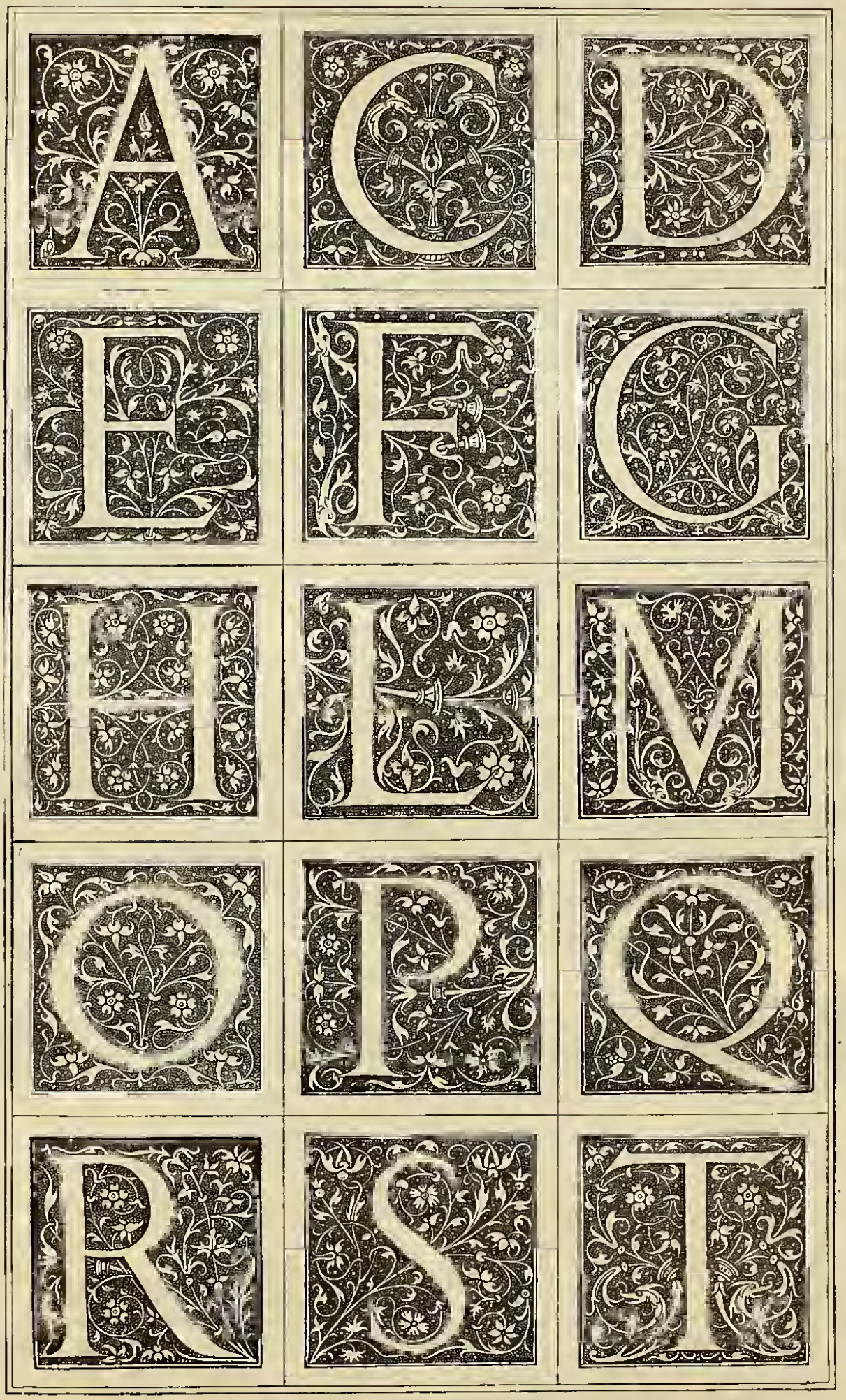
INITIAL LETTERS.

We give engravings of initial letters, the backgrounds of which are full of the most graceful and artistic forms, which we have thought some of our readers might find instructive and useful in various kinds of decorative work. These forms, or parts of them, may be readily enlarged to suit special requirements. The *Building News*, from which our illustrations are taken, gives the following:

Among the various designs for capital letters employed by the printers at the beginning of the 16th century, a very important position must be assigned to those of the French school, which found some of its foremost and best exponents among the members of the famous family of the Estiennes, perhaps better known to modern readers by their Latinized name of Stephanus. The beautiful interlacing designs used by Iodocus Badius doubtless suggested to the unknown artist who worked for R. Stephanus the motive upon which the decoration of the splendid initial letters employed by him is based. The monogram of the author of these designs is frequently found on the printers' devices and upon many of the woodcuts about this period. It consists of what is termed by heralds a "patriarchal cross," and it occurs beneath the center of the G in the letters we have reproduced, this being, we believe, the only one of the capitals thus distinguished.

May we hazard the conjecture that this was the first letter of the name of the author, and that it is to Geoffroy Tory, who was frequently employed by Stephanus, and who is said to have produced the fine folio device of an olive tree, with its broken and displaced branches, used by this printer, that we owe these charming designs? The mark in question bears a cross of the same kind near the roots of the tree, on the left side of the lower margin of the woodcut.

Very soon after the introduction of engraved initials printed with the type, we find such letters placed upon a background of interlaced ornament, which was at first coarse and rude, as in the work of Ratdolt at Venice in 1477, but which gradually became more graceful and refined in the early years of the 16th century, and reached its perfection in the large alphabet, designed probably for the great Bible issued by Stephanus in 1528, fifteen letters of which form the subject of our illustration.



FRENCH INITIAL LETTERS, 1532-1544.—BY ROBERT STEPHANUS, OF PARIS.

The letters we have selected give all the chief types of the ornament, from the stiff and somewhat heavy curves of the foliage of the L to the evenly distributed and well-balanced tracery of the S. In spite of many diversities of flowers and leafage, there is a strong family resemblance in all this ornament. The frequently repeated dolphin's head from which the principal lines spring in many of the letters, the graceful cornucopia introduced in others, and the five-petaled flower which occurs in most of them, show the same hand throughout. As examples of ornamental treatment, most of these letters furnish quite a study, and will bear looking into most carefully. Among other things we may note the skill with which the masses of light and dark are arranged, all the large surfaces of black in the background being broken up by means of minute dots of white. There is marvelous variety in the motion or framework of all this decoration, and in the admirable manner in which it is disposed. Each woodcut, in fact, constitutes a little picture, and we scarcely know which to select for special praise. Perhaps the S, which is one of the smallest of the letters, has afforded most scope for skillful treatment of the background, and the artist has here well availed himself of his opportunities. The stem springs from one corner of the square, and crosses the S almost at right angles, the chief tendrils shape themselves lovingly into corresponding curves in the top and bottom of the letter, while one of the main branches balances the terminal flower at the summit of the stem. The lines of the foliage and the seven or eight varieties of leaves and flowers are most harmonious. The initials here illustrated occur in the "Virgil" of 1532, and in the letters of Francis I., dated 1544.

G. R. R.

Chimneys.

For those parts of a chimney which are supported throughout, stone may, under some circumstances, be admissible, but brick is always preferable for the purpose. The abutments of a chimney should be tied into the walls by wrought iron bars of sufficient number and strength, turned up and down at the ends, and built into the jambs for several inches on each side. No part of a flue should be of less thickness than half a brick, or 4½ inches. Where slabs of stone or slate are placed level with a floor before the opening of a chimney, they should invariably be laid in sound mortar, cement, or other incombustible and non-conducting substance, and it should be at a distance of not less than 4½ inches from the joists, flooring, or any other woodwork. A chimney built only up to the roof and stopping at that point is always dangerous. Every chimney in a house should be perfectly distinct and separate from every other chimney, from the hearth to the external opening. Chimneys may safely be built in stacks, but they should on no account have any connection within the stacks. Brickwork around flues should not be less than 4½ inches thick in any part. By the Code Napoleon it was not permitted to build a chimney against the wall of an adjoining house without isolating it by an intermediate wall of sufficient thickness to prevent heat passing to the neighboring premises.—*The Architect.*

Preservation of Wood by Lime.

I have for many years been in the habit of preparing home-grown timber of the inferior sorts of fir—Scotch, spruce, and silver—by steeping it in a tank (that is, a hole dug in clay or peat, which was fairly watertight) in a saturated solution of lime. Its effect on the sapwood is to so harden it and fill the pores that it perfectly resists the attacks of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I have a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation. The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution from two to three months, by the end of which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two to three months' steeping is sufficient if the scantlings are cut to the sizes at which they are to be used.—*Field.*

HALF the time spent in fatiguing tramps after wild berries would supply better ones in a fruit garden. They grow well in the shade of trees or fence, and are easily tended and made productive by a liberal supply of cheap mulch.—*Hugh T. Brooks, in Michigan Horticulturist.*

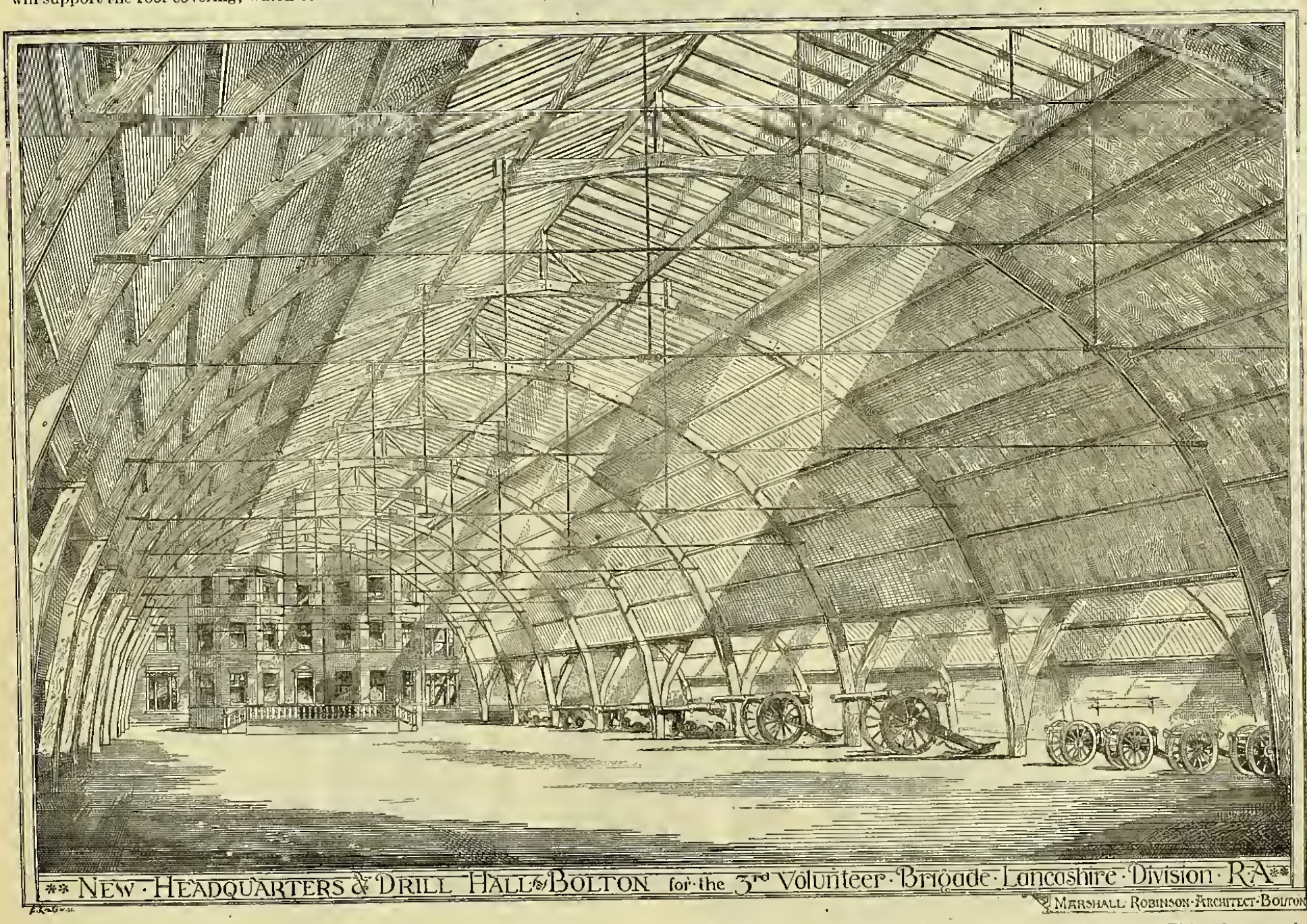
DRILL HALL, BOLTON.

The Bolton Artillery Corps, having for a long time felt the necessity of more capacious premises for drill purposes, have purchased a building in the heart of the town, known as Silverwell House, along with about 2,200 yards of open ground.

The house is exceedingly capacious, and with slight alteration will provide all the accommodation required for a headquarters, including mess and orderly rooms, instructors' quarters, lecture rooms, armory, and clothing stores, canteen, etc. It is proposed to erect upon the ground adjoining the house two large drill sheds, side by side, one 145 ft. by 80 ft. for company drill, and another for gun and gyn drill, 180 ft. by 45 ft.

The general construction of the sheds will consist of semicircular principals, half a diameter high, placed 14 ft. apart, composed of four thicknesses of 11 by 1½ in. planks bolted together, with broken joints. The feet of the principals will be received into cast iron shoes embedded in a foundation of concrete, and kept in position by means of wrought iron tie rods running transversely under ground. Light purlins, 5 ft. apart, will support the roof covering, which consists of slates and hoarding. This method of construction gives a permanent building of pleasing form at a very reasonable cost, which, besides doing duty as a drill hall, will be available for mass meetings, bazars, popular concerts, etc. The architect of the structure is Captain M. Robinson, M.S.A., of the corps, and the cost will not exceed £2,000, or $10,000.

The above, from the London *Building News*, is an example of a spacious structure at a moderate cost.


** New · Headquarters & Drill Hall · Bolton for the 3rd Volunteer · Brigade · Lancashire · Division · R.A. **
Marshall Robinson · Architect · Bolton

Asphalt Pavement.

After a long discussion of the merits of the various kinds of street pavement, a few months ago St. Paul decided to lay asphalt on two or three of its principal residence streets. The opposition to this material was very strong from leading property holders, who feared the effects of the climate, but in the short time it has been laid many who opposed it now pronounce it superior to any other pavement in use, and it is probable that the city will lay it very extensively next year. Mr. J. N. Granger has been one of the leading advocates of this material, and he has taken pains to obtain all existing information in regard to its use under different conditions of use, climate, etc. The following letter was addressed to Mr. Granger, in reply to queries from him, by a gentleman in Buffalo, who is said to be a leading authority on all kinds of roads and pavements, and whose experience extends over a period of thirty years.

First—"Does the noise of horses' feet upon the asphalt pavement become a nuisance to persons living upon the street?" It does not appear to me that horses traveling over asphalt pavement make any more noise than on stone pavements. The passing of the vehicle attached is noiseless, consequently the two together do not make near the noise on asphalt as over stone pavement. Again, the fact that the demand for this pavement is greatly increasing in this city is proof that the noise of horses' feet is not considered a nuisance.

Second—"Is it necessary to repair a pavement so that it will contain blotches?" The asphalt pavement with us can be replaced so that it is impossible to find the repair except upon the closest inspection. This I have seen in several instances. Ordinarily, in passing over it, the repair would not be seen or ever noticed.

Third—"Cannot we tunnel under the pavement so as to make water and sewer connections, without disturbing the surface, etc.?" Yes; I think you can tunnel under it, and that the concrete will hold up under ordinary traffic. I understand that it has been done successfully here. I would state, however, that as the repairs can be done so perfectly, people prefer to cut it out as a cheaper method. With us all connections for gas, sewer, or water are ordered in before any kind of pavement is laid. Water with us is laid at about four feet below the surface; gas about three feet. The sewerage, of course, depends on the character of the undulations and elevation of the street. In some places it may require more depth than in others; of course, always below frost.

Fourth—"Is it not a fact that when men drive up a street paved with asphalt, they will turn on to a side street paved with the same article in preference to turning on to a street paved with something else?" Traffic with us seeks the asphalt pavement, and drivers with heavy loads go blocks out of their way to strike it. This is notably so in a street newly paved with asphalt, in the heart of the city—Ellicotte Street, over which a large amount of traffic is constantly passing. In the upper part of the city the result is the same; there pleasure driving seeks the asphalt pavement, as well as traffic. In regard to width of street pavements, we have them from twenty-eight to sixty feet wide, usually governed by the width of the street. Linwood Avenue is a ninety-nine foot street, and the pavement thirty-eight feet; Delaware Avenue is one hundred feet wide, and the pavement forty-two feet; West Avenue is sixty-six feet wide, and the pavement thirty feet. Sidewalks upon narrower streets (residence streets) are four feet wide. On Linwood Avenue and other like streets they are six feet. This leaves say twenty-one feet for grass plat, six feet for sidewalk, then seven feet to fence or street line. The houses stand back from twenty to thirty feet, with fences removed, making a wide-looking street. Wherever the asphalt has been laid in this city, it is a fact that property on the street has increased in value much more than the cost of the pavement. It is also considered as having much to do in beautifying the streets on which it has been laid. That this city is very much in favor of asphalt pavement is shown by the fact that this season sixteen miles have been laid within the city limits.

The writer says the asphalt is rapidly taking the place of the Medina stone pavement, which has been in general use there for fifty years, and has given satisfaction, and the citizens are almost unanimously in favor of it, and adds:

The oldest asphalt laid here is Franklin Street. This, at the time, was an experiment. It was laid in 1878. Up to this time no repairs have been made or required on it, and, with the exception of surface wear, it is in as good condition as when first laid. When I speak of surface wear, I mean that the center or crown of the street may be worn off, say, from a quarter to half an inch. I will here state that with us all heavy traffic is carted on wagons with the tire four or five inches wide. This is a city ordinance, and all heavy loads are in wagons with that width of tire. This, of course, is for the benefit of all streets.

As to the effect of climatic changes on the asphalt, he says: With us, the climate seems to favor it. How it will stand the extreme heat and cold of St. Paul can, I think, only be determined by experiment, and he refers to the experience of Omaha, which is subject to extremes of heat and cold, as a guide for St. Paul. That this had already been ascertained and proved satisfactory he did not know.

PATENTS.

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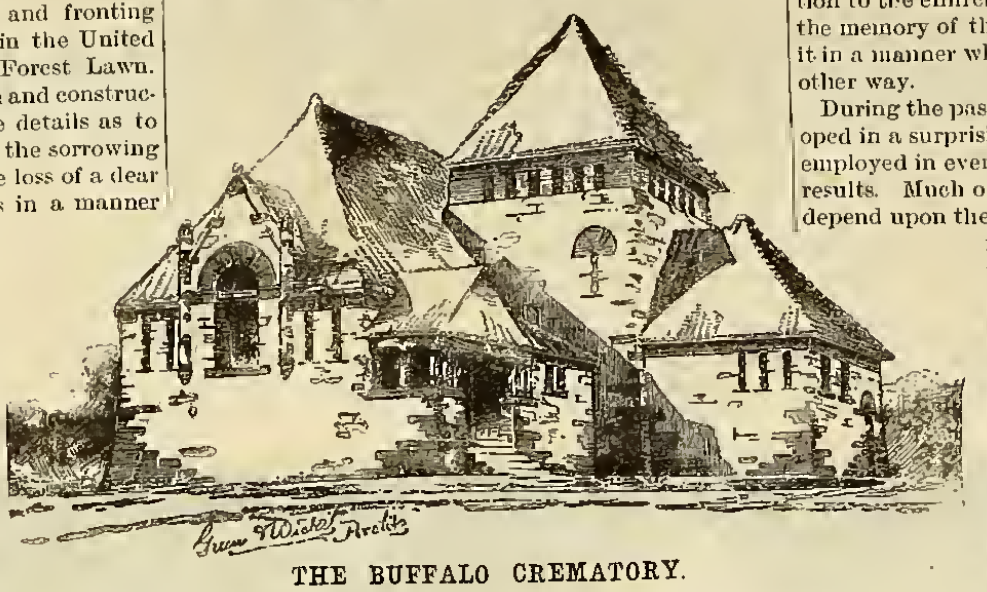
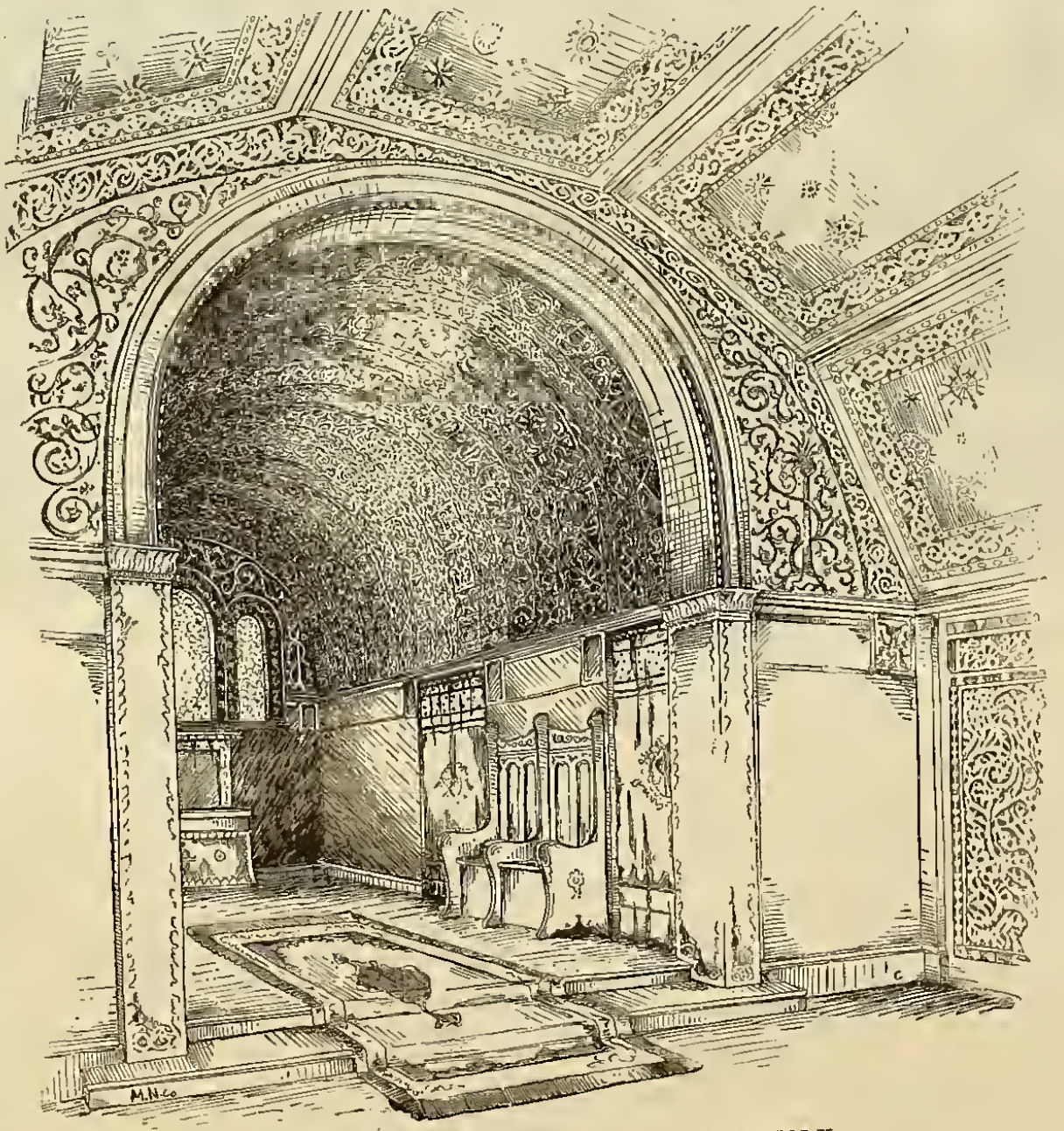
THE BUFFALO CREMATORY.

There has been erected in the city of Buffalo a temple for the incineration of the remains of those whose last wishes in regard to the disposal of their bodies were in favor of cremation, whose æsthetic surroundings please the most difficult taste. The location of the building is in the most beautiful part of the city—about twenty minutes' drive from the city hall, out Buffalo's far-famed Delaware Avenue, and fronting one of the most beautiful cemeteries in the United States (and, therefore, in the world), Forest Lawn. The idea of those interested in its location and construction has been to so arrange all the little details as to render as light as possible the task of the sorrowing one, who is left, not only to mourn the loss of a dear friend, but also to dispose of the remains in a manner least grating to the individual feeling and least harmful to the many.



THE BUFFALO CREMATORY.

The crematory is built of dark brown sandstone, in a plain, substantial style, reminding one of the small chapels built in the North Country centuries ago, with square tower and steep, slanting roof, covered with ivy and surrounded by sloping lawns. While the hearse conveys the body to the room where the undertaker removes it from the coffin and places it upon a bier, the relatives and friends enter the chapel, while the clergyman passes behind the organ to take his place in the chancel. The bier rolls noiselessly into the chancel, the organist begins a prelude to a chant, the ceremony takes place according to the desires of the survivors. The surroundings present the ordinary aspect of an earth burial ceremony at a church. The body lies on a handsomely draped bier in the chancel. The chancel is beautifully decorated in an early Italian style. There are twenty-one different symbols and devices interwoven in arches of peacock green and blue, while the windows, of rich stained glass, shed a light, dim and religious. The nave, too, is decorated in the same style. All the surroundings combine to show respect for the dead, while respecting the feelings of the living. The service over, the curtains are withdrawn, and the bier glides noiselessly out of sight of the congregation. The crowd disperses, the incineration takes place privately, and the ashes are taken by the undertaker, to be disposed of as the body would have been, or left to form the nucleus of a columbarium. —*Sanitary News.*



THE CHANCEL IN THE BUFFALO CREMATORY.

Cleaning Cherry or Ash.

As the proper cleaning and finishing of oak or cherry require considerable care and skill, it will be interesting to notice the practical treatment which the woods undergo under the hands of the wood-worker.

Cherry, as in tables, framing, etc., is usually roughed off by the planing machine and worked into its required shape before finishing. When, as in the case of a veneered door, the frame is ready for cleaning off, it is laid on and firmly fastened to the bench by strips cut in between the joggles, then carefully surfaced or leveled over with the fore-plane. This is in itself a delicate operation, as the surfaces of the pieces must be exactly flush under a straight edge—that is to say, across the face stiles must be on the same level as the face of the rails, and the latter on the same level as the mullions; in short, the surfaces must all be in the same plane and the stiles likewise straightened. All lumps must be reduced, and great caution exercised to avoid sprawling corners. Use the plane with the grain, as the contrary works out holes and causes more trouble with the smoother. This done, it is usual to smooth off with a closely set, well-sharpened plane, or, better still, a Bailey iron plane. Some woodworkers object to using the iron plane, as it marks the stuff, and causes much scraping afterward, but it never breaks corners, and will work well against cross-grained stuff like this. Having finished smoothing, proceed to scrape the surface with a scraper which will cut to a shaving. Work carefully with the grain and take out all holes and rough spots, especially near the joints. When scraping across joints, bend the scraper with the hands and avoid tearing up the grain on either side of the joint. Obliterate every imperfection noticeable before applying the sandpaper, which should be No. 1, and used with a broad, flat cork rubber. On no account sandpaper across the joints, as the grit in the sandpaper will score across the sensitive surface, but work close to the endwood joint, and then with the grain of the jointed stile or rail, as the case may be. Of course the result of the operation depends on the operator's skill, but an exceedingly neat job can be done with a little care.

Ash is, perhaps, the most difficult of all the woods to clean, as the grain is of an open and straight nature, varied with a frequently recurring tough cross spot. Like cherry wood, after going through similar treatment, it shows a beautiful surface, which, being filled and varnished or polished, looks rich and glossy, the one dark and warm and the other light and elegant. After sandpapering, rough spots are seen by white blotches, and they can be easily scraped out as before. In these days, when pine is almost obsolete and the hard woods growing in popular favor, it is essential that their treatment be understood.—*Owen B. Maginnis, in Builder and Wood-worker.*

Stained Glass.

An enduring art and an old one is that of the execution of stained glass. Originally an art distinctly identified with religion in its application to churches, it is now equally connected with buildings of every kind. Now, as ever, it constitutes the best form for memorials; best because of its great enduring qualities and best by reason of the charm added as a decoration to the church as a structure, serving to keep alive the memory of the dead or the donor associated with it in a manner which could scarcely be obtained in any other way.

During the past ten years or so, the art has developed in a surprising manner, until now the material is employed in every variety of building with excellent results. Much of the good effect in stained glass will depend upon the artistic merit of the design, and, unfortunately, with the greatly increased use of the material, much of it has been manufactured of a very inferior and inartistic order.

At the same time, it is but fair to say that development of the art has been productive of work from some of our best artists which has reached a standard of merit comparing favorably with, if, indeed, it does not equal, that of past ages, as exemplified in the magnificent examples still found in the European churches, many of them in as good a condition as on the day they were executed.

Foremost among the artists whose efforts in this direction have been so successful is Mr. Louis C. Tiffany, now the President and Art Director of the Tiffany Glass Company, of 333 Fourth Avenue, New York City. This company have executed the designs of some of our finest artists, among whom may be mentioned Maitland Armstrong, Robert Blum, E. W. Longfellow, F. D. Millet, Elihu Vedder, and W. H. Low. Its work is represented by memorial windows and less important work in all parts of the country, and among these may be mentioned that in St. Paul's, Milwaukee, Wis., which is a reproduction of Doré's renowned painting, "Christ before the Prætorium." This window contains nearly 200 life size figures, and is all executed in colored glass alone, the only portions painted being the faces, hands, and feet. The innumerable shades and forms, the folds of drapery, and the numberless shadows are obtained by the use of colored glass of different tones, and the whole work is of rare merit.

The company have executed work in many of the public buildings in the country, such as Columbia, Yale, Princeton, and Williams Colleges; the White House at Washington; the Cotton Exchange, the Seventh Regiment Armory in New York, and in a very large number of private residences and smaller buildings.

Convention of the Western Association of Architects.

The third annual convention of this association was held at Chicago, on Nov. 17, 18, and 19 last, and was well attended. President Dankman Adler, in his practical and carefully considered opening address, offered his congratulations upon the great progress made in architecture generally in this country during the past few years. He said that what might be called a new style—an American style—developed by the wants and conditions of civilization in the 19th century, had arisen, and he urged the members to do all in their power in further developing it. Mr. I. Hodgson read a paper treating of the same subject, and among the other practical papers read may be mentioned "Proportions of Joints and Connections in Framed Structures," by S. G. Artingstall, "The Relation of State Medicine to the Profession of Architecture," by Dr. O. C. De Wolf, and "Hospitals for the Insane," by E. H. Ketchem.

Plants for House Decoration.

During winter, and especially at this season, great numbers of plants are required for house decoration, and no one should object to this use of them, seeing how much they beautify the different sites assigned to them. So much are we accustomed to seeing and admiring well-grown plants in front halls, corridors, dining rooms, drawing rooms, and in other positions, that we really think a house desolate without them; and for this reason, as well as on account of the knowledge that plants thus employed are much more appreciated than those always kept where grown, that we never demur at any reasonable request for decorative flowering or fine foliaged plants. Many are under the impression that a few days' sojourn in a house proves most injurious to plants so employed, and sometimes this is the case, the rubbish heap receiving many that have been ruined, either from the effects of gas, neglect, or too long a stay in a darkened corner. Those who grow the plants, or some one equally experienced, ought also to attend to them when in a house. Overzealous and inexperienced persons are apt to be too free with the watering pot or jug, a daily saturation quickly ruining a plant. Many under-gardeners are also very reckless in this respect, both giving too much and too cold water Some of the most effective decorative plants have to be taken from plant stoves, and, therefore, when in a cooler atmosphere, they ought to receive less water than usual rather than more of it, and it ought always to be slightly warmed. Even cool house plants require less water than usual in much darkened rooms, where they are often placed, and where they suffer when watered daily almost as badly as stove plants. Not a few stands are water tight, and unless a little judgment is exercised, the plants may soon be standing in water. Our plan is to change most of the plants every Saturday morning, those to be introduced being properly moistened at the roots before they are taken into the house. About three times during the ensuing week all are carefully examined, and if approaching dryness a little water is given. No house or window plant ought to stand in tins or saucers partly filled with water, yet such is too often their lot, and this is bound to soon ruin them beyond recovery. Nor, on the other hand, should they suffer from want of water, though they are more likely to recover from this check than they are from being overwatered.

It is really surprising how long some plants, notably the maiden hair fern, will remain healthy either in a window or in a fairly light position, provided no cold draughts of air or water are given them, and they are carefully watered. Several other Adiantums, notably palmatum, gracillimum, assimile, Capillus veneris (of which magnificum is the best form), mundulum, Lawsonianum, formosum, and Williamsi are very serviceable for house decoration, and will keep fresh for a long time. The same may be said of Pteris serrulata and its various crested forms. P. tremula, Asparagus plumosus scandens, and such Palms as Areca Baueri, Chamærops, Kentia australis, Latania, borboniea, Phœnix dactylifera, and Seafortbia elegans are all good for house decoration, and these and other kinds mentioned are available for those who may only possess a greenhouse or cool conservatory in which to grow them when not required in the house. Pans or pots of Selaginellas are very effective in the house; and I know instances where they are kept near a window all the year round and always look fresh. For this purpose I can recommend S. Kraussiana (denticulata) and its golden and silver forms, Wildenovi and stolonifera. I know a case in which a handsome plant of the Filmy Fern (Todea superba) has been grown in a large pan under a bell glass for six years, and it annually improves. It stands under a stained glass window at the end of the principal staircase, and being frequently watered and never allowed to become very dry overhead, it is always attractive in appearance. Begonias of the Rex type are also good house plants, and everybody must know what a good servant Ficus elastica is. Of greenhouse flowering plants, Arum Lilies prove the most difficult to kill, and under fairly good treatment plants in seven inch pots will flower freely in a window. Cyclamen persicum also thrives and blooms well under similar conditions; but Chinese Primulas are apt to lose color, and present a miserable appearance unless much favored. Cinerarias are not easily kept clean. Cypripedium insigne will last on a table, not far from the light, longer than any other flowering plant, provided always it does not suffer from want of water. Epiphyllum truncatum, or Crab Cactus, as cottagers prefer to term it, will, if not over-watered or overpotted at any time, flower beautifully in a window, and the old Cactus speciosissimus is still a favorite for house decoration.—*W. I., in The Garden.*

AUTUMN FLOWERS.—DRAWN BY JULES LAREE, FROM THE PAINTING BY VICTOR LECLAIRE.—*From Le Monde Illustre.*

Floating bricks are now manufactured in France, the material of which they are composed being a kind of earth found in Tuscany, consisting of 55 parts of sandy earth, 15 of magnesia, 14 of water, 12 alumina, 3 lime, and 1 iron. It exhales a clay-like odor, and, when sprinkled with water, throws out a light, whitish smoke. It is infusible in the fire, and, though it loses about an eighth part of its weight, its bulk is scarcely diminished. Bricks composed of this substance resist water, unite perfectly with lime, are subject to no alteration from the heat or cold, and the baked differ from the unbaked only in the sonorous quality which they acquire from the fire. Their strength is a little inferior to that of common bricks, but much greater in proportion to their weight.

The Story of a Greek Statue.

Visitors to the Louvre of late may have noticed a remarkable little marble statue labeled "A Young Athenian Girl." The story of its discovery and acquisition, just disclosed by the *Temps*, forms a curious page in the history of antiquities. A peasant of Patissia, while digging in the fields, suddenly came across an old statue. Knowing that the Greek law forbids the exportation of ancient objects of art found in the country, and that foreign amateurs are always ready to pay a high price for them, he at once took it home and hid it under a heap of fagots. He then went to the French ambassador, who was well known for his love of such relics, and offered it to him for 12,000 francs. The ambassador repaired secretly to the peasant's dwelling to examine it, and found it was a *bona fide* gem of the fourth century. He telegraphed the discovery to the French minister of fine arts, who authorized him to conclude the bargain. But there was a serious difficulty to overcome, and that was to get it out of the country without being detected by the customs authorities. After some reflection the ambassador instructed the peasant how to set to work. He was to hide the statue in a cartload of vegetables, drive down to a creek on the seashore, where he would find a boat from the French sloop stationed at the Piræus waiting to receive him. The job was performed successfully. The statue, in the midst of the vegetables, was shipped on the boat, and the 12,000 francs were handed to the peasant by the captain as he left the shore. On the arrival of the statue in Paris it was placed in the Louvre, not far from the famous Venus of Milo, while its discoverer, the poor Greek peasant, is now leading the life of a small gentleman farmer on the proceeds.—*Pall Mall Gazette.*

Steaming vs. Fumigating.

A correspondent of *The Garden* directs the attention of plant growers and orchid growers to the advantages of the practice of boiling tobacco juice in houses for the destruction of insects over the old practice of fumigating. One great advantage is that the steam does not scald nor discolor the most tender foliage nor the most delicate flower; that it can be done without previous preparation, *i. e.*, drying the foliage, etc.; and that the operator can walk about in the house if necessary during the operation.

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A WINDMILL TOWER AND WATER TANK AT NARRAGANSETT PIER, R. I.

CONSTABLE BROTHERS ARCHITECTS.

[For description see page 46.]

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☞ Orders for subscriptions and back numbers will be received at the old rates until April 1. Those who wish to avail themselves of the low prices should send their orders without delay.

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[Continued from page 24.]

THE AMERICAN INSTITUTE OF ARCHITECTS.

A GLANCE AT THE CHARACTER OF THEIR WORK, AND ITS INFLUENCE UPON THE GROWTH OF AMERICAN ART.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

With the idea of americanizing our architecture, it was proposed that some connection be established between the students of our architectural schools and the supervising architect of the government. Precedents for such action are numerous. The building of the dome of Cologne Cathedral was cited. Other instances might be mentioned, such as the inducements offered to the graduating classes of the University at Palermo in reference to designing some portion of the great Cathedral of Milan. The project referred to was to give, as a graduation honor, a two years' appointment to service under the supervising architect. This appointment to be determined in some perfectly fair way by competition. The successful man to spend one year in the draughting room, and one year as assistant superintendent of outside construction. The usual salary paid for such services to accompany the appointment. It was believed that this scheme would identify the students of architecture, and, indirectly, the people themselves, with the art growth of our country.

Whatever derogatory may be said of the exteriors, our government buildings are acknowledged by Europeans to be the most commodious and convenient government buildings in the world; and many of the later buildings, notably the post office at Lexington, Kentucky, show a remarkable advance in architectural treatment. If, through the medium of our museums, our art galleries, our schools of design and architecture, our public and private buildings, we cannot interest this nation in its own art growth, then there is no help in us.

From a sanitary point of view, the Institute was addressed by the well-known specialist, Mr. Charles F. Wingate. The tendencies of sanitary progress were noted. It struck him as absurd that the sanitary expert should be called upon to overhaul buildings after they were completed and occupied, instead of having consulted him in advance when the plans were prepared. He dwelt upon the importance of a dry site and a house free from dampness. The prevalence of consumption and a large number of other ailments is directly traceable to damp soil and improper drainage. The exceptionally low death rate of London is to be ascribed, largely, to its perfect soil drainage, while the high mortality in New York from zymotic diseases is due chiefly to damp cellars upon a saturated subsoil. The details of interior plumbing work was cited to explain the cause of the late typhoid fever outbreak in Brooklyn. The necessity of a trap to disconnect dwellings from street sewers was urged, and the enlargement of soil pipe at the roof to the full sum of the areas of the small pipes leading to it was insisted upon. Air inlets came under the same heading, and were recommended to be as large as the house drain. That a contrary practice prevails to some extent is unquestioned. Methods of sewage disposal were considered. The irrigation system was criticised in certain particulars, and the necessity for some cheap and universally applicable substitute for cesspools emphasized. The speaker regarded the lack of ventilation in dwellings as the most serious source of injury to health. Impure and overheated air is a prime factor in creating disease. The public generally resort to window ventilation as a relief from oppressive air. Open fireplaces are a luxury, and, as such, must be considered unavailable to the mass of humanity. To find a house or any part of it well ventilated is as rare as a jewel. Within a recent period, improvements have been made in the construction of electric motors, so that, by means of small fans operated by these motors, it is now practicable to ventilate any room or building at a trifling expense. An electric motor that formerly cost $135 can now be made for one-fifth that amount, and foul air, by its means, can be forced out of a room, even in winter, without creating a draught, while in summer a cool current can be blown inward. This is one of the most remarkable improvements in modern science. It is not a monopoly, as several appliances of the kind are now in use and successfully working. Ventilation has been as good as a lost art. It now bids fair to take proper rank among modern sciences. A house may be the home of defective plumbing, leaky drains, or built on saturated soil; but if impure air can be driven out and pure air drawn in to take its place, the noxious vapors which are not forced out may be so diluted as to be rendered almost harmless.

Many of the members availed themselves of the courtesy of Prof. Ware to visit the architectural department of Columbia College, to inspect the system of instruction pursued there, the work of the students, and, lastly, and to some minds the most important, the now famous Kansas City Exchange competitive drawings. It was generally conceded that the successful drawings were worthy of the honor awarded them. The amount of work on each set of the drawings, singly and collectively, forced upon almost every beholder the conviction that a vast amount of time, labor, and genius were wasted on competitive drawings. The home of Mr. Marquand was thrown open to inspection of the members, and to say that the quaint elegance of its costly rooms, the seductive beauty of its mural paintings, the refined taste displayed in every adornment and enrichment, made a deep impression, would be merely to pass one more encomium upon the growth and beauty of American art.

The general feeling of the Institute in regard to unity of action among the members was announced in the report of the Board of Trustees. It was stated that the Institute cannot progress or maintain its hold upon the respect of the public without the steady support of its individual members. The evils of unregulated practice were incidentally alluded to. In order that the professional architect shall do the best work he is capable of doing, in order that he shall do something for the art growth of the country, for the sake of art and the country itself, and in order that he shall raise the standards of comparison and estimation, he must have the moral support of the people themselves. Can the profession accomplish this and be in conflict with itself?

At this session of the convention, grave charges of unprofessional conduct were preferred against a member of the Institute. Documentary proof was offered in support of these charges. They were referred to a committee for examination and a report. The evidence was found to be complete. The offending member was requested to resign, and in this way the pernicious evil was rebuked. The constitution of the Institute forbids the expulsion of a member for unprofessional conduct. Other organizations, similarly united for mutual protection and defense against the pretensions of quacks or pettifoggers, are obliged to resort to expulsion to restore to the association its proper *esprit de corps*.

In the discussion which followed the substantiation of these charges, several members advanced the recommendation of a more careful inquiry into the antecedents and present standing of applicants. The sense of the convention in regard to the measures to be taken to avoid a repetition of such charges was not fully brought out, but, admitting the wisdom of the recommendation alluded to, it does not strike at the origin of the trouble. Perhaps it is impossible to enact a law that will, but it seems that the disgrace of expulsion to a member in good standing must greatly exceed the discomfiture of a rejected applicant. To the former, the blow is equivalent to a dishonorable retirement from the profession. To the latter, it does not necessarily imply disgrace. It may mean simply inefficiency, or incapacity, or want of experience, the latter of which may be overcome by study and time.

The annual dinner, on the evening of the second day, was given at Pinard's; and in the excellent discussions of art topics, in the quiet but timely hits at the architectural follies of the day (for even architects will admit that they sometimes imitate their clients, who do have follies), in the good fellowship that prevailed, and in the social amenities of the hour—perhaps it was more than one hour—the dinner may be pronounced a success. As a matter of reference, the names of the officers chosen for the ensuing year are herewith appended:

Thomas U. Walter, of Philadelphia, president.

O. P. Hatfield, treasurer; A. J. Bloor, secretary; both of New York.

The board of trustees are: H. M. Congdon, N. Le Brun, E. T. Littell, R. M. Upjohn.

The committee on publication: H. H. Holly, New York; Chas. Crapsey, Cincinnati; T. M. Clark, Boston; J. McArthur, Philadelphia.

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The secretary of foreign correspondence: W. L. B. Jenny, Chicago.

DESIGN FOR A WINDMILL TOWER AND WATER TANK.

We give on our first page a design for a windmill tower, which is worthy of attention for the novelty and boldness of its conception. It is a striking departure from the common plan of such structures, which are ordinarily made to resemble some old barn or outhouse, devoid of taste or elegance. This design shows how prettily such a subject may be treated. The example we give will serve, we hope, a useful purpose in leading owners and builders to think and study how they may improve the forms and lines of all such structures. A little care and thought will sometimes do wonders. Our engraving is from the *Real Estate Bulletin*. This windmill was recently erected at Narragansett Pier, R. I., by Edward Earle, Esq., to supply water for ten cottages built by him at that place. It was designed by Constable Brothers, engineers and architects of this city, and, in its position among the summer cottages at Narragansett Pier, forms a very ornamental addition to the landscape. The water is supplied by driven wells, and is pumped up by the wind power into the reservoir at the top of the tower, whence it is distributed by gravity pressure

throughout the ten cottages erected adjacent to it. It has proved adequate for all demands made upon it, and not only furnishes an abundant supply of water for domestic purposes, but provides an ample means of fire protection.

A ONE STORY DWELLING.

We illustrate this month, in our colored plate and sheet of details, a style of dwelling much in demand in the southern parts of the country, in which the whole plan is arranged on one floor. The design, drawings, specification, and estimate are by Mr. Christopher Myers, architect, of Montclair, N. J.

There are several important advantages attached to the adoption of an arrangement of this kind. Chief among them is the facility afforded for access to the rooms, and the saving of stairs. The system has the further gain of producing a warmer house, and one which, from the exterior, gives the impression of large extent.

In order that our readers may derive the fullest advantage from the design, the architect has drawn up a complete bill of quantities, with the cost of the various items attached. This we print below. In adapting the design for erection in any particular locality, where the prices differ from those given, it will be an easy matter to adjust the difference. In the vicinity of New York, the building would cost $4,828.77, as shown by the items in the bill of quantities. To ascertain the cost of building in other localities, where labor or material is either cheaper or dearer than in New York, a corresponding reduction or increase must be made in the items affected.

The design is entirely a practical one, and has been carefully considered in the smallest detail. The elevation is very skillfully treated. As a matter of fact, it is very difficult to obtain a satisfactory elevation in this class of house. The great length compared to the height, unless very carefully treated, will always have the effect of a squatty appearance.

Mr. Myers has managed to overcome this difficulty by cutting up the sides of the building with a number of breaks and offsets, providing several hips and gables, and in constructing two turrets. The external details are effective, while being simple and moderate in cost, and the whole result is a most attractive elevation, with excellent skylines and a certain homelike aspect that will be generally admired.

The planning has been arranged in a manner which, although, perhaps, not open to much improvement, could be readily altered to adapt itself to special requirements. For instance, the main staircase in the hall occupies a good deal of space, and could be omitted altogether, if it were not intended to use the attic, thus leaving a hall measuring 12 feet 8 inches by 23 feet 8 inches. The position of the bath room would then be slightly altered, or it might be left out altogether. On the other hand, if the house were constructed exactly as it is represented on plan, the attic could be finished off and utilized for bed and other rooms.

It will be observed that the kitchen forms a wing, distinct from, although attached to, the main block, and the advantages of such an arrangement are too obvious to need comment. At the South, where one story houses are common, it is usual to detach the kitchen entirely, and it will be seen that this could be done in this case without in any way interfering with the main design as it stands. The kitchen has a large bedroom over it, which could be easily divided into two if necessary, and a cellar beneath.

On the plan shown on the colored sheet it was found necessary to cut off a portion of the kitchen. On the detail sheet, however, we give this plan in full, with the dimensions of the various parts.

Specification.

Specification of the work required to be done and the materials to be supplied in the complete erection and finishing of a frame dwelling house, from the designs and under the superintendence of Christopher Myers, architect, Montclair, N. J.

General Conditions.—The drawings taken in connection with this specification are intended to provide for the complete erection of the house in all respects. If anything necessary for such completion should either be omitted to be mentioned in the specification or shown upon the plans, the same is to be executed without extra charge, to the true intent of the said drawings and specification.

The work is to be done in a thorough and workmanlike manner, and to be finished in all respects to the entire satisfaction of the architect.

MASON'S WORK.

Excavating.—Excavate cellar under kitchen to a depth of 4½ feet; all foundations 30 inches deep; the cellar wall to be 1 foot 4 inches thick, built of field or quarry stone, to height of 7 feet in the clear; all foundation walls to be level with kitchen wall; all the stonework exposed to view to have struck joints in cement; inside of cellar walls to be pointed flush; the trenches and under foundations of all brick piers and under walls, and chimneys, to be grouted in with cement grouting. Build brick piers where shown on plans, of good hard burnt brick. Build chimneys where shown, of good hard burnt brick. Joints for all flues to be struck. Brick for the top to be selected. All chimneys to have bluestone caps and hond stone, each 3 inches thick. Build kitchen fireplace with front brick laid in red mortar, with bluestone shelf and hearth, both rubbed.

Hearths.—Furnish all fireplaces with rubbed bluestone hearths; furnish and put in all necessary thimbles where directed.

Cementing.—Cement the entire cellar bottom of kitchen cellar with cement composed of 2 parts of sharp screened gravel and 1 part of Rosendale cement.

Plastering.—Lath and plaster the entire first story of main house and first and second story of kitchen, 3 coat work; scratch brown and sand finish; the closets to be laid on in two coats, also plaster privy in two coats. Furnish and set four center pieces in parlor, library, dining room, and hall, to cost seven dollars in all and to be selected by owner.

Privy Vault.—Build privy vault of stone 6 feet x 5 feet and 4 feet deep.

Stoop Stones.—Put down stoop stones where shown, to be of good heavy bluestone, in two lengths to each stoop and two feet wide, these stones to have foundations 26 inches deep, filled in with small stone.

Cistern.—Build cistern 10 feet x 10 feet in the clear, of good hard burnt brick, domed over on top with manhole and flat bluestone on top 2 feet square. Cement the inside with Rosendale cement, and leave perfectly tight.

Cesspools.—Build cesspools where directed, within 60 feet from the house; one to be 8 x 8 feet in the clear, built of brick and cemented inside and made tight, and the other of rough field stone laid in dry, both to be domed over on top and to have bluestone 2 feet square. Run a 4 foot pipe from one to the other turned down in the tight one.

Drain Tiles.—Run a system of tile pipe 4 inches from all the leaders to cisterns with well cemented joints.

CARPENTER'S WORK.

Size of Timber, etc.—Sills, 3 x 8 in. laid flat; summers, 6 x 10 in.; first and second tier beams, 2 x 10, placed 16 in. on centers and bridged every 8 ft. where space will permit; main post, 4 x 6 in.; plates, 4 x 6 in.; main rafters, 2 x 8 in., 24 in. on centers; piazza rafters, 2 x 6 in., 24 in. centers; piazza ceiling beams, 2 x 6 in., 24 in. centers; hip rafters, 2 x 8 in.; valley rafters, 3 x 8 in.; ridge pieces, 2 x 8 in.; all studding, 2 x 4 in., 16 in. on centers, all door and window studs to be doubled, all door and window heads to be doubled, these studs to be well spiked at tops and bottom; piazza sills, 3 x 7 in., beam, 3 x 8 in.

Sheathing.—Sheathe all the vertical sides with matched hemlock boards laid diagonally.

Siding.—Put on siding where shown on plans, 6 in. Michigan strips, laid 4¼ in. to the weather.

Paper.—Paper all the vertical sides with No. 30 Manila building paper, lapped well and laid under all eaves boards and window and door frames.

Shingles and Lath.—Lath the entire roof with 1 x 2 in. spruce lath laid 5 in apart; cover these with best xxx 18 in. pine shingles, laid not more than 5 in. to the weather.

Cornice.—Form cornice as shown on the details, of good soft pine lumber.

Side Shingling.—Shingle the sides of building where marked, the bottom course to be rounded or hexagonal, as shown.

Window and Door Frames.—Make window and door frames as shown on the plans. Windows to be made for double sliding sash, hung on weights and cords. Door frames to be made with rabbeted jambs and 1¼ in. outside casing.

Water Table, Corner Boards, etc.—Put on water table as shown on plans, of good soft pine lumber. Corner boards, 1¼ x 5½ in.

Piazza, Stoops, etc.—Put up piazza as shown on plans and details, cornice and ceiling as shown, the floor of piazza and stoops to be laid with narrow matched boards laid in white lead joints and blind nailed; put up all lattice, stoops, etc., to suit the grade.

Tinning, Leaders, and Flashing.—Put in all necessary gutters and valleys of I. C. charcoal tin, 2 ft. wide, also put up all necessary 4 in. leaders to convey water to ground, with copper tubes in gutters. Do all necessary flashing of every description.

Ornamental Work, Brackets, etc.—Put up all necessary ornamental work, as shown on the elevations, of good, clear, soft pine. See details.

Finials.—Finish and set boxed wood finial on one spire, and furnish and set one metal finial of some neat design on the elevations.

Blinds.—Furnish and hang complete, painted outside, rolling blinds on all first-story windows and second windows in kitchen. No blinds on cellar or second story of main part. The blinds to have domestic fastenings where needed, and all other fastenings to make them complete.

Sashes and Glazing.—All sashes to be made as shown on the various elevations, and glazed with second quality, double thick, French sheet glass, the cellar and attic single thick. All this glass to be well puttied.

Floors.—The entire first floor, except kitchen and bath room, to be laid with sound narrow tongued and grooved pine boards. Kitchen and bath room, yellow pine. Second story to be floored with wide flooring pine, all well laid and nailed.

Partitions, Bridging, etc.—Set all partitions, where shown on the floor plans, with 2 in. x 4 in. joist, 16 in. on centers, and well nailed at both ends. Bridge these partitions with 2 in. x 4 in. midway up, put in horizontally, and well nailed at each end. Bridge all the floor beams with 2 in. x 2 in. herringbone bridging, accurately cut at each end, and well nailed.

Grounds.—Furnish and set all necessary grounds for mason to finish to.

Door Jambs, Trimmings, Bases, etc.—All door jambs to be 1¼ in. thick, rabbeted; all casings as per detail; bases scribed to floor.

Wainscot.—Wainscot the kitchen 3 ft 6 in. high, with 3 in. yellow pine strips with bead on edge, and finish with nosing and cove finish; bath room the same.

Stairs.—Build main stairs, as shown on plans, with 1¼ in. treads, ⅞ in. risers, 1¼ in. strings, these to be inclosed with narrow pine ceiling 3 in. wide, forming rail on second floor. The kitchen stairs in similar manner. Build cellar stairs of rough spruce plank.

Bath Room.—Finish bath fittings in ash, top and facing to tub, facing to wash bowl, riser, seat, and lid to water closet; all these doors and lids hung with brass butts.

Doors.—The front door to be made in two sections, 2 in. thick by 8 ft. high, and moulded, paneled, etc., as shown on front elevation, and to have glass in upper panel, of French plate glass; all other room doors to be 1⅛ in. thick, four paneled and flush moulded; closet doors 1¼ in. thick, made in same manner. All doors to have hardwood saddles. All hearths to have hardwood hearth borders. All doors, where needed, to have rubber tipped bumpers.

Corner Beads.—All exposed plaster corners to have corner beads, nailed on with turned ends.

Closets and Pantries.—Kitchen and dining room closets to have a tier of five shelves high. Kitchen pantry to be regularly shelved. Bed room closets to have two shelves, with hanging hooks underneath.

The niche on either side of library windows to be regularly shelved up; all these shelves throughout to rest on rabbeted cleats neatly nailed to the wall.

Hardware.—All the double hung windows to hang on cast iron weights and to have Italian sash cord, and to have an improved bronzed sash fast; all windows which swing to hang on tight 3 x 3 butts, including cellar; all these windows to have proper hooks and fastenings. The front door to be hung on 5 x 5 in. imitation bronze butts, two to each door, and to have an improved lock and night latchment, with bronze knob outside and brass face flush bolts, to fasten doors together. Sliding doors to have "Hatfield" patent anti friction sheaves with brass track and astragal sliding-door locks, brass face and brass flush handles. Other doors to be hung with 4 x 4 in. imitation bronze butts. All room doors to have 4½ in. mortise locks, brass face, city make; all closet doors to have reverse bevel rim locks, the knobs throughout to be jet and bronze. Furnish all necessary wardrobe hooks, catches, buttons, hooks, small bolts, etc., and everything to complete the job.

Privy.—Build privy 6 x 5 ft. and 7 ft. high, to be studded for plastering, and exterior finished same as house; to have seats with covers to holes, hinged panel door, and two small windows.

Coal Bins.—Build coal bins in cellar, where directed, of rough hemlock boards.

Tubs.—Build and put up three wash trays, where directed, of 2 in. clear well seasoned white pine, jointed together in white lead, and set on turned legs, and to have 1¼ in. hinged covers.

Mantels and Grates.—The mantels and grates will be furnished by the owner, and contractor is to allow $200 for same.

PAINTER'S WORK.

The whole of exterior of building to be painted two good coats of English white lead and linseed oil in such colors as may be directed; all tin work to be painted two coats of "Prince's" metallic paint. Chimneys painted same as house, all sashes cut in; also paint the bottoms of all outside doors and tops and bottoms of sashes; all knots and sap to be coated with shellac before priming is done; putty up all nail holes and cracks, joints, etc., and after priming is done, the outside of privy to be painted same as the house, the inside to be painted white.

Inside Finish.—The inside to be finished with "Wheeler's" wood filler well picked out, and to be treated with two coats of hard oil finish, rubbed down on the last coat. All the nail holes to be puttied up, color to match that of wood. All door saddles and hearth borders to be oiled, the hard floors to be oiled and rubbed down.

PLUMBER'S WORK.

Drain Pipes.—Furnish and put in where shown on the plans a 4 in. cast iron drain pipe, to run from inside of building out to the tile drain 4 ft. outside of building, the drain tile to be trapped inside of the cel-

lar wall, and to be supplied with fresh air from the outside of building, with iron pipe run through the foundation, and to have a perforated cover, as directed by the architect. In every case use Y branches for all iron pipe connections.

Soil.—Furnish and connect with drain in cellar a 4 in. cast iron soil pipe, and run same up to at least 4 ft. above roof, and cap with the "Smith" patented ventilating cap. Use Y branches for all waste connections. Coat the iron pipe with asphaltum, and in the cellar insert a 4 in. cleaning cap.

Calking.—All joints of all iron pipes are to be thoroughly calked with oakum and molten lead, and fastened in position with iron hooks. All joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipes, and lead pipes soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on the plans a 35 gallon copper boiler, and provide with drain cock for emptying the boiler and with shut-off cock for shutting the water off from second story. Provide with circulating pipe complete. Connect boiler draw cock with the sink waste. Put in a coubined safe and cockrun valve on pipe at top of boiler. Boiler to have the "Lockwood" stand.

Exhaust.—Run from the highest point in hot water pipe a ½ in. lead pipe, to carry same 1 ft. above tank top, and bend over.

Pump.—Furnish and set in kitchen, where shown on plans, a No. 2½ "Douglass" horizontal double-acting suction and force pump, brass lined, and connected to a 1¼ in. B lead suction pipe. Insert an air cock, to prevent pipe from freezing in cold weather.

Supply.—From the pump carry a 1 in. A lead pipe to enter bottom of tank, the same to act as a house supply. Place a 1 in. finished stop with waste on the pipes in bath room. Provide a check valve near pump, so that cold water over sink must be drawn by pumping. Hot and cold supply all through the house to ⅝ in. A lead pipe. And all pipes are to be graded so they will drain perfectly dry. Control each floor separately by ⅝ in. finished stop and waste.

Sink.—Sink to be 18 in. by 30 in., of galvanized iron, with two front legs, trapped with 1½ in. trap and lead waste of 1½ in. connected to the 2 in. iron soil under floor; also insert a cleaning cap at the point. Sink to be supplied with hot and cold water through ⅝ in. A lead pipe and through "Peck's" improved lever handle bibbs. Flash the woodwork back of sink with 3 lb. sheet lead 15 in. high.

Bath.—Furnish and put up, where shown on the plans, a 16 ounce tinned and planished bath tub 5 ft. long, supplied with hot and cold water through ⅝ in. A lead pipe. To have a nickel plated combination compression bath cock, with rubber hose and sprinkler. Waste through a 1½ in. trap and 1½ in. C lead pipe, properly connected to main soil. Furnish the nickel chain and plug.

Bowl.—Furnish and set, where shown on the plans, a 14 in. patented overflow wash basin of best Italian marble, with countersunk marble slab 22 in. by 30 in., and back 10 in. high, supplied with hot and cold water through ½ in. A lead pipe and "Peck's" improved nickel plated basin cocks. To have 1¼ in. D lead waste pipe trapped with a 1¼ in. trap, and properly connected to main soil. Furnish nickel chain and plug and fancy chain stay.

Air Chamber.—Place no cocks on end of pipes, but extend pipe at least 6 in., so as to provide an air chamber.

Water Closet.—Furnish and set in bath room, where shown on the plans, one "Inadosn" all-porcelain washout closet, with drip tray, also set up a painted iron cistern with flush tank attached. Supply cistern through ⅝ in. A lead pipe from main tank cistern, to supply closet through 1¼ in. D pipe. Ventilate the closet trap with a 3 in. lead pipe calked into main soil. Insert the nickel cap and pull in the seat.

Safe Pans.—The bath tub, bowl, and water closet are to be provided with 3 lb. lead safes, turned up 2 in. all around, and to have ¾ in. D waste pipe running to cellar.

Wash Trays.—Supply wash trays with hot and cold water through ⅝ in. A lead pipe, and brass tray bibbs with flanges and thimbles. Provide an 1½ in. lead waste, connected to main soil, and properly trapped. Provide necessary chains and plugs of brass. Every trap to be placed as near to the fixtures as possible. Every trap in house to be separately ventilated, the same size as trap, and either connect with main soil above bath room fixtures or run independently to 4 ft. above roof line, and there cap.

Range.—Furnish and set a "Newport" range, and connect with boiler. The hot water pipe from range to boiler to be ¾ in. A.

Tank.—Line the tank, as given on plans, with 16 oz. tinned sheet copper, and leave complete with overflows and inlets.

Gas Pipes.—Put up gas pipes with outlets, as shown on the plans, and according to the rules of the gas light companies. All outlets are to be capped, and all pipes tested. All side lights are to be not less than 5 ft. 6 in. from floor. All drop lights to be hung plumb.

ESTIMATE AND BILL OF MATERIALS AS PER SPECIFICATION ABOVE.

Mason's Work, etc.	Each.	
115 cubic yards excavating	$ 25	$25 75
8 brick piers complete	3 00	24 00
4 stoop stones laid complete	10 00	40 00
66 perches stone work	4 50	297 00
38 perches filling to trenches	2 00	76 00
286 feet cement bottom	4	11 44
2 cesspools complete		40 00
1 cistern		50 00
1 privy vault complete		8 00
Drain tiles complete		30 00
1 chimney complete		180 00
890 yards sup. plastering	40	356 00
4 center pieces		7 00
1 bluestone hearth and sbelf set		20 00
Incidental expenses		25 00
Total		$1,193 19

No. of pieces.	Size.	*Carpenter's Work.*	
2	3″×8″×24′ 0″	= 96 feet.	
2	" ×25′ 4″	= 101 "	
1	" ×29′ 4″	= 59 "	
1	" ×18′ 0″	= 36 "	
1	" ×17′ 0″	= 34 "	
2	" ×21′ 0″	= 84 "	
2	" ×16′ 0″	= 64 "	
		=	474 feet.
35	2″×10″×16′ 0″	= 934 feet.	
64	" ×13′ 0″	=1,387 "	
40	" ×11′ 0″	= 734 "	
48	" ×14′ 0″	=1,120 "	
30	" ×17′ 0′,	= 850 "	
		=	5,052 feet.
31	2″×8″×16′ 0″	= 662 feet.	
40	" ×12′ 0″	= 640 "	
14	" ×14′ 0″	= 261 "	
45	" ×18′ 0″	=1,080 "	
4	" ×21′ 0″	= 112 "	
8	" ×20′ 0″	= 213 "	
1	" ×24′ 0″	= 32 "	
1	" ×32′ 0″	= 43 "	
1	" ×26′ 0″	= 35 "	
16	" ×13′ 0″	= 277 "	
		=	3,355 feet.
2	4″×6″×24′ 0″	= 96 feet.	
4	" ×16′ 0″	= 128 "	
1	" ×25′ 0″	= 50 "	
3	" ×12′ 0″	= 72 "	
3	" ×15′ 0″	= 90 "	
4	" ×18′ 0″	= 144 "	
1	" ×20′ 0″	= 40 "	
1	" ×14′ 0″	= 28 "	
1	" ×28′ 0″	= 56 "	
		=	704 feet.
2	4″×4″×22′ 0″	= 59 feet.	
2	" ×16′ 0″	= 43 "	
		=	102 feet.
6	4″×6″×16′ 0″	= 192 feet.	
8	" ×20′ 0″	= 320 "	
25	" ×14′ 0″	= 700 "	
		=	1,212 feet.
80	2″×4″×16′ 0″	= 853 feet.	
400	" ×14′ 0″	=3,733 "	
		=	4,586 feet.
1	3″×7″×20′ 0″	= 35 feet.	
1	" ×24′ 0″	= 42 "	
1	" ×18′ 0″	= 32 "	
1	" ×14′ 0″	= 25 "	
1	" ×27′ 0″	= 47 "	
		=	181 feet.
3	2″×7″×12′ 0″	= 42 feet.	
2	" ×18′ 0″	= 42 "	
1	" ×16′ 0″	= 19 "	
1	" ×14′ 0″	= 16 "	
1	" ×20′ 0″	= 23 "	
2	" ×24′ 0″	= 56 "	
1	" ×22′ 0″	= 26 "	
		=	224 feet.
			15,803 feet.

	Each.	
15,863 feet dimension timber laid on	$ 25	$306 58
30,000 18" pine shingles laid on roof	7 50	225 00
840 1×2×12 shingle lath laid	7	58 80
12,000 18" pine shingles for vertical sides laid on	7 50	90 00
3,200 feet matched sheathing and paper for vertical sides laid on	25	80 00
1,200 feet 6" siding laid on	40	48 00
5,500 " main and piazza cornice put up	55	303 50
265 feet wator table put on	30	79 50
3 square columns back porches fixed	2 00	6 00
4 turned columns front piazza fixed	3 00	12 00
1 stoop post put up	1 50	1 50
50 feet piazza rails and balusters put up	45	22 50
53 feet facia and lattice put up	$ 40	$21 20
Front steps complete		18 00
Three other steps complete		25 00
575 feet piazza and stoop floors laid	8	46 00
550 feet piazza ceiling laid	8	44 00
200 " five inch corner board	5	10 00
4 large brackets	2 50	10 00
2 radiators on side gable	3 50	7 00
Ornamental filling in piazza gables		12 00
5 sections of ornamental filling front piazza	8 00	40 00
1 wood finial on spire		4 00
1 metal " "		10 00
Tin work and conductors		60 00
225 feet band course at bottom of shingles	20	45 00
2,200 feet first floor laid complete	5	110 00
2,000 " second floor laid complete	5	100 00
4 cellar windows complete	2 00	8 00
22 first story windows with blinds	14 00	308 00
6 second story windows, blinds over kitchen	10 00	60 00
28 doors complete, hung and trimmed	10 00	280 00
400 feet 7" base and moulding	6	24 00
8 closets finished complete	3 00	24 00
Finishing bath room complete		20 00
Cellar stairs complete		5 00
Kitchen stairs complete		22 00
Front stairs complete, including ceiling		50 00
Mantels and setting, including grates		225 00
Outside privy		15 00
Incidental expenses and jobbing for other trades		150 00
		$3,075 58

Summary.

Mason's work	$1,193 19
Plumber's work as per specification	310 00
Painting outside and finishing inside	250 00
Carpenter's work	3,075 58
Total	$4,828 77

A $2,600 COTTAGE.

A portion of the colored plate accompanying the present number represents a cottage of pleasing appearance, lately erected for Mr. W. P. Macomber at Portsmouth, R. I. The treatment of the roof and convenient arrangement of the rooms are both very satisfactory, and the whole design is one of considerable merit and usefulness.

Mr. George W. Cady, the successful and well-known architect, of 164 Westminster Street, Providence, R. I., is the author of the design.

A number of detail drawings, with roof plan and elevations, are shown upon our supplementary sheet, and following is the specification used in the erection of the building:

SPECIFICATION OF A DWELLING TO BE BUILT ON THE OWNER'S LOT, AT PORTSMOUTH, R. I., FOR MR. W. P. MACOMBER.

The house to be as per plans and figures on the same, substantially as shown, all dimensions to be verified on the works.

Excavator.—The cellar the full extent of the house. Trenches for foundation of steps or piers, and cross wall, pipes for drain, chimney foundations, and cesspools and cisterns to be dug the required depth, and all dirt not wanted for grading to be carted off. The loam to be saved by itself. Cellar 7 ft. 6 in. deep in the clear. All outside piers, etc., 2 ft. 6 in. under surface to their foundations. Cesspool 20 ft. from the house; size, 10 ft. deep, 6 ft. at the bottom, tapering to top, and covered over with flat stone under surface 2 ft. House foundation stone, 6 in. under cellar bottom. The same for chimneys.

Walls.—The cellar walls to be built up 18 in. thick, laid in cement mortar, underpinning faced both sides. Outside rubble work, natural face, the joints struck. Cellarway jambs the same. Chimney piers good common work.

Cross Walls.—The several cross walls to be of brick, laid in mortar, close up to joists, and between joists up to floors, using good, hard building brick. The piazza piers to be Danvas brick.

Chimneys.—To be built as per plans. Hearth places arched to trimmer. The several fireplaces to be laid up with Danvas pressed brick. The tops to be the same. Flash with 3 oz. lead at roof. The shaft to be good brick, laid full in mortar. Black mortar in the fireplaces and tops. The shaft to be plastered directly on the brick, on the outside, from cellar to roof. Pipe rings of 6 in. vitrified pipe to be built in where required.

Cesspool.—To be stoned up, and covered with stone or brick arch. Six inch vitrified drain pipe, to be run from house to it, trapped outside of wall, all well cemented, tight and secure.

Lath and Plastering.—The first and second stories to be lathed on sides and plastered. One good coat of spruce lath, well nailed, and good, strong mortar. Slake and run lime through sieve. Mix with clear grit sand and cattle hair in proper proportions. Put on and float. The three rooms and hall in the attic to have one good coat. sides and ceiling.

Pointing.—Point and whitewash the cellar walls.

Cement.—Cellar steps to be bluestone, with brick pier. Window stools rowlock course of brick laid in cement. Cellar bottom to be cemented in the ball and wash rooms 2½ in. thick, level and true in the Rosendale cement and sand, in proportions of 1 to 3.

Cistern.—A cistern to be dug to hold about 2,000 gallons, to be cemented on the earth secure and tight, with overflow to a dry well. The inlet pipes to be 3 in. vitrified drain pipe, leading to the conductors. This pipe to run to the bottom of the cistern (will require 25 ft. of pipe). The pump pipe to be cemented in the bottom end, to be covered with a beehive brick filter.

CARPENTER'S WORK.

Generally.—The building to be well framed, with good mill sawed spruce timber, spiked and nailed securely together. Sizes as follows: sills and posts 4 in. x 6 in., piazza sills 6 in. x 6 in., resting girts of second floor, at ends of joist, 4 in. x 6 in., cross beams 6 in. x 8 in. Frame in end floor joist and halve studs, plate 4 in. x 4 in., joist 2 in. x 8 in., 16 in. centers, 4 in. x 8 in. under cross and openings, and for trimmer heads and joist, ceiling joist, attic 1¼ in. x 6 in. Also over L, studs, 2 in. x 4 in. outside, 16 in. centers, curb of L 2 in. x 8 in. Rafters, 1 slant 2 in. x 4 in., 2 ft. center, upper 2 in. x 8 in. cambered. Main rafters 2 in. x 7 in., hips and valley rafters 2 in. x 8 in., 2 ft. centers, ridge 1 in. x 8 in., inside main partition 2 in. x 4, 16 in. centers, double at doors and trussed, others 2 in. x 3 in. Set all partitions under 3 in. x 4 in. plate. Notch on joists, etc. Plate of piazza 4 in. x 6 in. Rafters 2 in. x 6 in., planed and jack planed cornered, ½ in. ends from bracket, main rafters the same, all as per plan and details.

Boards.—Boarding of piazza roof 1⅛ in. planed, matched, and beaded spruce, laid smooth side down. Top roof of L the same, ⅞, not beaded. Back porch roof the same as the front. Other boarding on sides and roof to center of band on sides, mill planed hemlock, square edge. All well nailed.

Boarding below the band to be ⅞ in. weather boarding, 5 in. widths, sound seasoned pine, Michigan strips, nailed square through. Band, ⅞ in.; corner boards, 6⅞ in.; base ⅞.

Jett.—Main jett and other finish pine, and as plans and detail. The gutter on the main house to be trimmed. Two 3½ in. tin outlets will be put in where directed to connect conductors. The valleys will be shingled open, on one width of tin strip, painted both sides before the shingles are laid. Fastenings will be put in where required. A 4 in. dug out pine gutter will be put in at the flat on L, and the water supply the tank. Two short pieces of the gutter to be put from valley to it.

Roof.—The main roof and piazza and porch roofs to be shingled with first quality of Eastern shaved shingles, laid out not over 5 in. to the weather, and well nailed. The gable and sides to be 4 in., shingled with the same kind, laid not over 5½ in. to weather, and nailed as above. So much as comes in the gables will be clipped on but 1 in.

Paper.—Between the studs of the first story, put resin sized sheathing paper against the boarding, secured with a lath or strip nailed to stud.

Door Frames.—Cellar door frames rabbeted, 3x4 joist for size of doors required. All other door frames rabbeted plank of the kind of stock that may be chosen.

Window Frames.—The cellar window frames to be rabbeted pine plank, as per sizes given, 1¼ in. sash, to be hung with butts, and fasten down with button and up with hook and staple, ⅛ in. wire.

Main.—All the other window frames to have hard pine pulley stile, plowed for spline and bead, 1⅜ in. lip sash, sizes given, plank stools, and as per plans, all to be fitted with Sweet's spring on top and bottom sash, also with thumb lifts.

Partition.—All the several partitions to be well set, and the furring complete to receive the lath. Carpenters will cut for pipes and ease where required.

Iron Roof.—The flat part of the roof to be covered with Smith's patent iron roofing, painted two coats.

Floors.—The attic floor to be ⅞ in. planed and matched spruce, well driven up and nailed. Other floors, except as hereafter designated, 1⅛ in. spruce, as above. Kitchen, closets, bath room, and back hall floors 1⅛ in. Southern hard pine, as above. Piazza and porch floors the same, square edge. Dining room floor, alternate strip of cherry and maple, 3 in. in width.

Sides.—The sides of the kitchen, back halls, and back stairs, also the bath room, well sheathed upright, 3 ft. high, with Southern hard pine, ½ in., as above, on the top edge, 1½ in. moulding.

Stairs.—Back stairs built with side partition of ⅞ in. hard pine, treads 1⅛, risers ⅞, and cove the same. Cellar flight the same, flight to attic the same.

Front.—The front flight to be post and rail stairs, all ash, treads 1⅛ in., risers ⅞ in., strings 1⅛ in., rail 2 in. x 4 in., post 4 in. x 4 in., turned top and bottom, balusters 1¾ in. turned pattern face hand, under band, nosing and cover. Cellar sash, 1¼, two lights; attic sash, 1¼, lights as follows: Second story sash, 1⅜ lip; first story sash, 1⅜ lip. Glass to be first quality French sheet.

Doors.—Front doors will be one pair 7 ft. 6 in. x 5 ft. 1¾ in., panels as shown, upper ones glazed (plain). Vestibule doors the same size, 1⅜ in., three panels to each part. Library and dining room doors the same as vestibule. Other doors, 2 ft. 10 in. x 6 ft. 10 in. x 1⅜ in., five raised panels and cope moulding, all alike. Second story doors the same, 2 ft. 8 in. x 6 ft. 6 in., 1⅜ in., second quality. Attic doors 2 ft. 6 in. x 6 ft. 6 in., 1¼ in., four panels, third quality, all well fitted and hung. The two back doors to be 1¾ in. thick, 2 ft. 10 in. x 6 ft. 10 in., as above. Use suitable size black enameled acorn butts and flush edge bolts on double doors, top and bottom; barrel bolt on back doors, good two-lever mortise locks, brass face and strike; common butts and iron faced locks in attic; strap hinge and box lock, with thumb latch for all cellar doors, closet cupboards, etc., doors to have brouzed iron catches and pulls, suitable butts.

Hardware.—Knobs of attic, kitchen, and all doors in rear of sitting room, etc., to be white porcelain, nickel rose and escutcheons, maple strikers behind all. Doors of library, dining room, sitting room, etc., to be pearl white, bright rose and escutcheon. Front door, bright bronze, bell pull the same.

Finish.—Dining room to be finished in pine, sitting room to be finished in ash, and library to be finished in pine. Second story, front of back hall, in pine; rear room, bath, and hall, hard pine. Casings, single architrave, not to exceed 5 in. bases, 7⅛ in. with 2 in. moulding, for best rooms. 6 in. in attic and presses, press and closet casings 3 in. Band around dining room 5 in. wide moulded. Pine strip 2½ in. (shelves) in each press, 1 in closets, as may be required, stool casings.

Casings.—Case up bath tub, bowl, and seat in black walnut, as usually done.

Hooks.—put up wardrobe hooks of double pattern, in all cloth presses, one row all around.

Closets.—Closets to be finished in pine, the dining room closet to have broad shelf, under it one shelf in cupboard, and three drawers put in slide between, the other closet put up five shelves on back side and three over slide. Fit up in the other closet with broad shelves, a place for flour barrel, cupboard with one shelf, and three 2 ft. drawers, four shelves over broad shelves on two sides, all as per plans. Put up in the kitchen a wide dresser shelf, with cupboards. Set one 3 ft. 6 in. x 24 in. "Miller" sink. Case up with cupboards. Case a wash bowl in pine on the stoop. Set the 3 in. x 6 in. joist over the bath room, so as to make a tank 1 ft. 6 in. lower than other ceilings, and build up a tank 3 ft. deep the size of the bath room, stud the sizes up to the roof, and line with 1⅛ spruce matched stock, all well secured.

Blinds.—To be hung to all the windows, two fold common lap slat blinds, with the best fastenings.

Conductors.—To be two stacks of 2 in. x 4 in. corrugated iron conductors, put up where the drains stop at the rear end, also two at the front to the ground.

Tubs.—Carpenters to build three plank washtubs, set the same and build a piece of floor in front of them the length and 3 ft. wide.

PLUMBING.

Line the tank 6 ft. 6 in. x 12 ft., 3 ft. deep, with 16 oz. planished copper. Put in a 3 in. copper inlet pipe from the gutter to it, also a cup top 3 in. overflow pipe to the conductor. This tank to be supplied with water from the cistern with a 2½ in. double acting force pump, located at the kitchen sink. Suction pipe 1¼ in. connecting cistern, main rise pipe 1⅛ in. to tank. Put in shut off between tank and pump, put stop cock at sink. Waste pipe to sink to be 1½ in. lead, 3 lb., well trapped, and connecting drain.

Set in bath room one 5 ft. 6 in. copper (16 oz.) planished bath tub, supply from tank, with stop, and ⅝ in. A pipe, waste 2½ lb., and trapped. Set one "Bartholomew" water closet, with S lead trap, 4 in. soil pipe of cast iron, socket joint calked with lead. Supply from tank with ⅝ in. A pipe. Set one 12 in. porcelain wash bowl, with back end and top slab of marble. Supply with ⅝ in. A pipe and stop.

Set a bowl, the same kind, in the porch, top slab wood. The soil pipe will vent out of the roof in 2 in. pipe, the water closet will vent under the seat into the chimney flue in tin pipe. All the stops, handles, etc., of the plumbing works, showing, to be nickel plated.

Fit two "Miller" sinks, supply and waste, one to be in the kitchen. Set one 25 gallon range boiler, with circulation and hot water to all in the bath room, the two sinks and one of the wash tubs. Fit the wash tubs with supply and waste, as above, for the plumbing.

Mantels.—There are to be six wooden mantels built, with the finish of the rooms, all of hardwood, 4 in. pine and 2 in. ash, at an average cost of $10 apiece. Put up a shelf at kitchen chimney of hard pine, supported on brackets.

PAINTING.

The outside finish to be painted two coats of Johns' asbestos prepared paint, as follows: Gable shingle and that on the sides red, the main finish light drab, the weather boarding dark drab, piazza floors oiled two coats. The inside hardwoods to be covered with shellac two flowing coats, the pine work painted two coats, the floors to be oiled two coats where hard woods are used, all work to be well rubbed on first coat and puttied clean, and to match wood or paint.

Generally.—This specification is intended to cover all the items to fully complete the above named house, according to the plans accompanying the specification, and the detail for the same, to the satisfaction of the owner and of Geo. W. Cady, architect.

OUR FIRST TWO VOLUMES.

The first and second volumes of our ARCHITECTS AND BUILDERS EDITION, comprising all the issues of the work from its commencement to close of 1886, are now ready for delivery, bound in handsome paper covers. Price $1.50 per volume. To be had at this office and of book and news dealers throughout the country. Those who have not seen a year's collection of our numbers put together will be surprised at the wealth and variety of contents which these volumes present, as well as at the cheapness of the price.

These two volumes contain all the numbers of the work from its commencement up to and including December, 1886. They embrace twenty-eight splendid plates in colors, representing the perspective elevations and plans of various dwellings, all having attractive features; fourteen large double sheets of details of construction of structures, nearly two hundred additional engravings of architectural subjects, public works, buildings, dwelling houses, cottages, etc., with plans; and upward of six hundred other engravings, mostly of superior character, illustrative of works and subjects interesting to architects and builders. Including all the separate diagrams and engravings of construction details, the two volumes present not far from two thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work.

A Splendid Number for April.

The next number of our paper, April, will be one of unusual excellence. One of the colored plates will present a perspective view of a dwelling of small cost, built especially with a view to alteration and enlargement at a future time, should the owner so desire. The arrangement of doors, windows, and floor plans is such as to coincide with the plans of the new enlargement whenever made. Full working drawings, a sheet of details, estimates and specifications will be given. In a following number we shall give a colored plate, showing the appearance of the same dwelling after its enlargement and improvement, with working drawings, estimates, etc.

We shall also present in our next number a series of beautiful illustrations of ornamental plaster work, showing how the interior apartments of dwellings may be greatly improved in appearance at a very small cost. These illustrations will be accompanied by practical directions for executing the work, and will be invaluable to builders and plasterers, as well as to architects and owners. In addition to the foregoing, many beautiful plates, plans, and engravings of dwellings and buildings of all kinds will be presented, of rare interest and value.

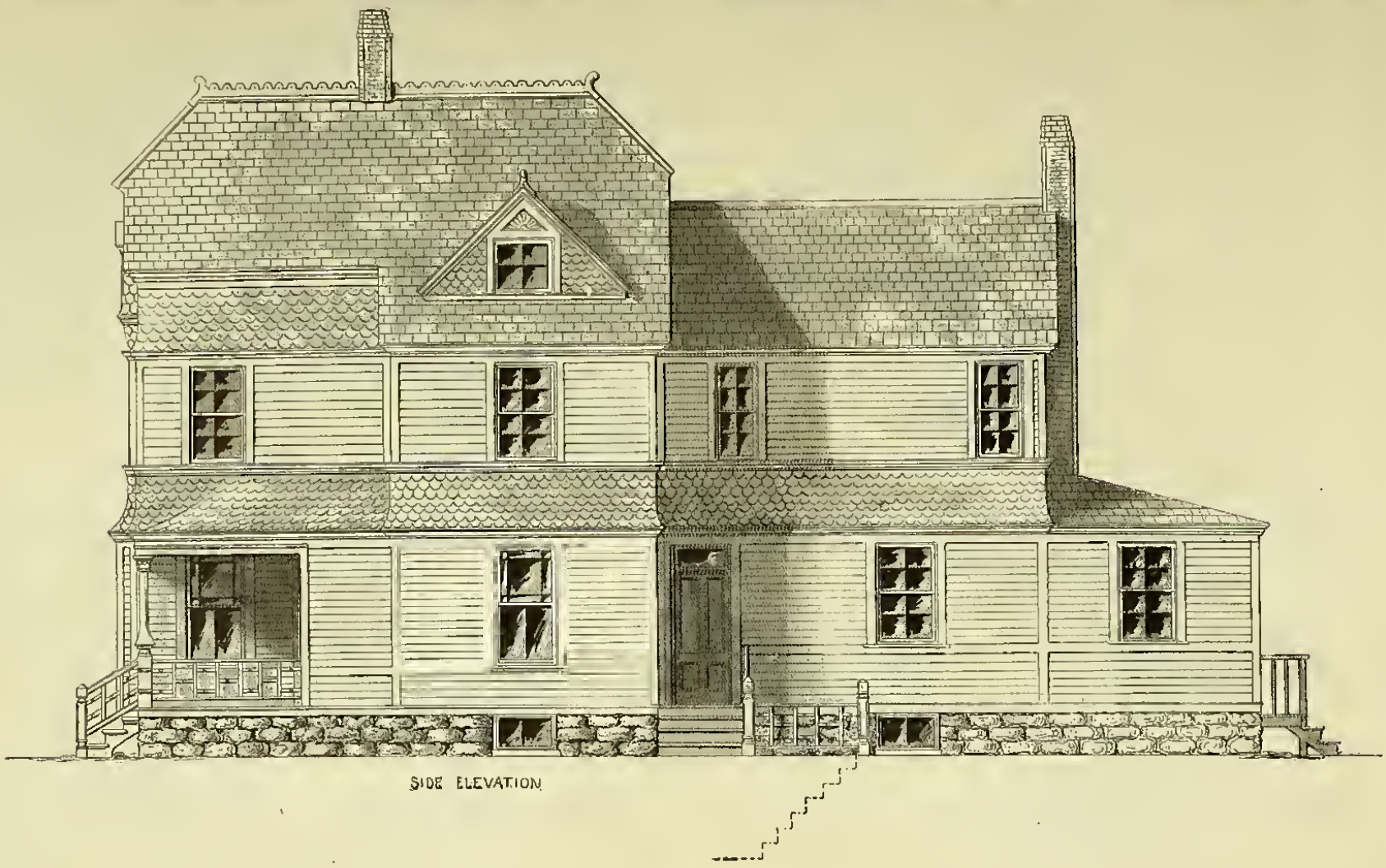
We believe there is no other building paper at present published in which so many plans, details, and specifications are regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction. Architects, builders, householders, and all who contemplate building of any kind should possess this work. It is full of useful information, and its illustrations have a permanent value for suggestion and reference.

A Notable Copper Roof.

The State of Texas, which is about completing its new capitol, will cover it with copper, using about 800 squares.

The Cincinnati Corrugating Co., of Cincinnati, Ohio, has the contract for this copper roof, which will be, perhaps, the largest amount on a single building in the United States.

A PROPER, safe working load for wire ropes is as follows: One-half inch in diameter, 1,000 pounds; five-eighths rope, 1,500 pounds; three-fourths rope, 3,500 pounds; one inch rope 6,000 pounds. This is for nineteen wires to the strand, hemp centers.



SIDE ELEVATION.

A Suburban Dwelling.

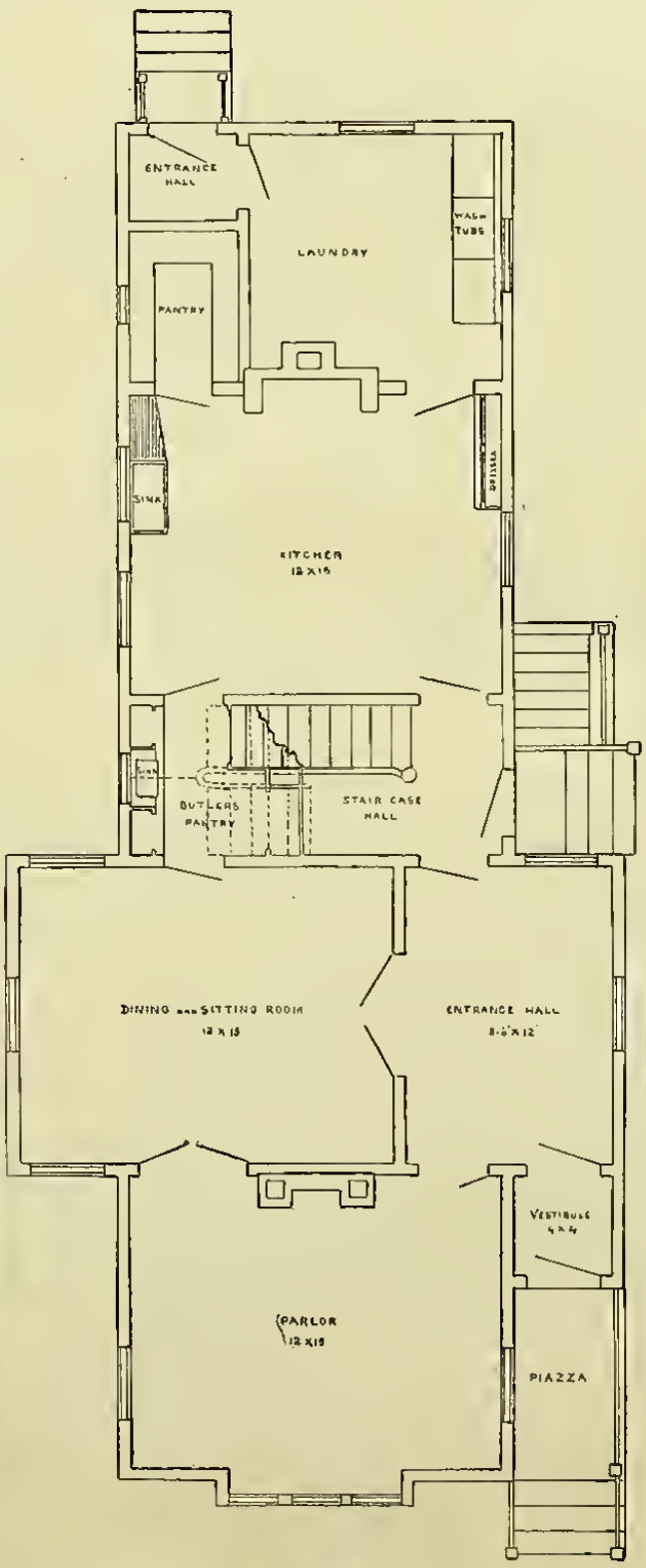
Cost, $2,800.

Charles G. Jones, Architect,

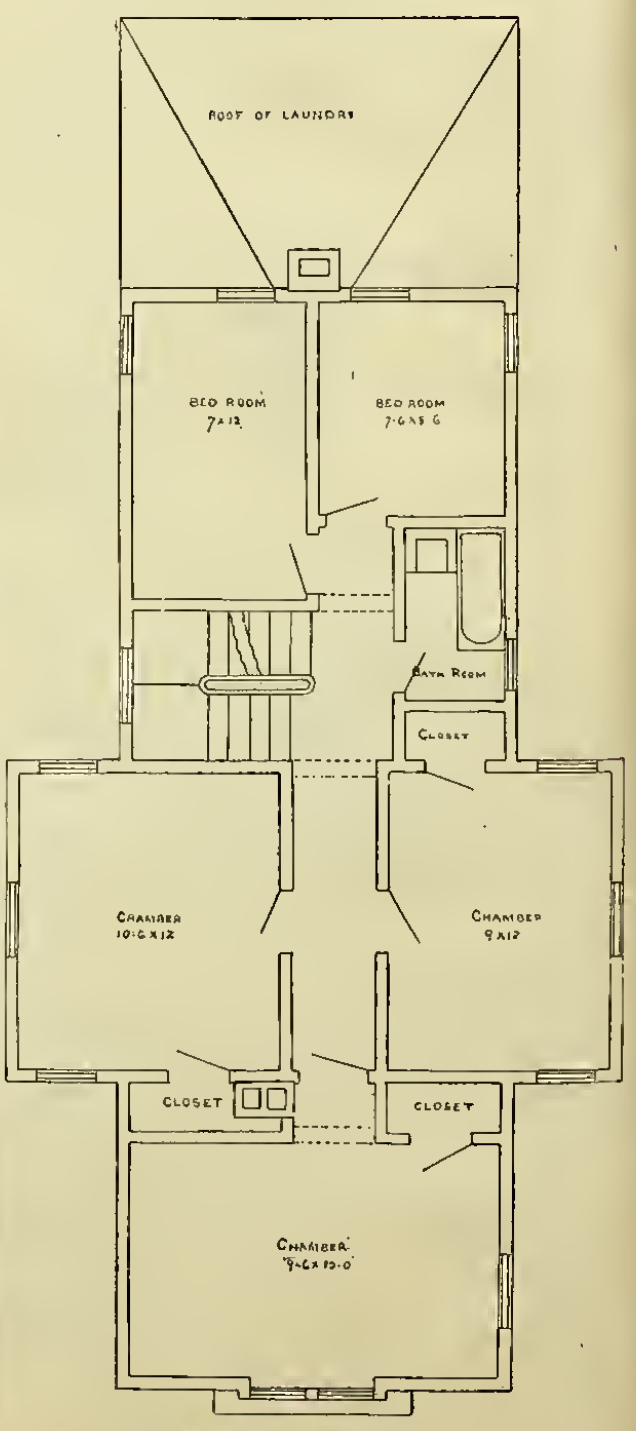
New York.

[For description see page 59.]

FRONT ELEVATION.



FIRST FLOOR PLAN.

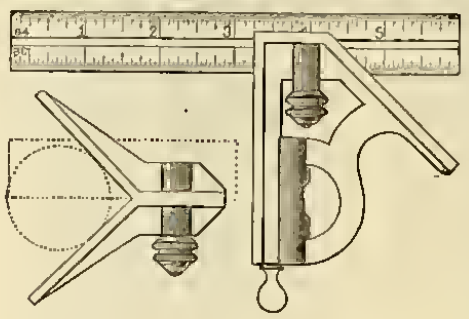


SECOND FLOOR PLAN.

Scale, one-eighth inch to one foot.

STARRETT'S PATENT COMBINATION SQUARE.

With the adjustable scale this forms one of the most convenient and useful tools devised for the use of carpenters and mechanics. One is a complete substitute for a whole set of common try squares, and is one of the best gauges for transferring exact measurement or laying out work. It is also convenient for a depth gauge or to square in a mortise. For a miter it is per feet, while with the auxiliary center-head it forms a centering square, both inside and outside, which is unequaled for convenience and accuracy. L S Starrett,



of Athol, Mass., is the manufacturer, and will be pleased to send his catalogue and price list of fine tools for carpenters and machinists on application.

WOMEN OUT OF DOORS.

It is thirty years and more since Thomas Wentworth Higginson wrote his famous essay on "Saints and their Bodies." It struck a new note. Before that time, the intellect and the soul had been cultivated. Learning, philanthropy, and religion were of consequence. To cultivate the body might be well enough for pugilists and circus riders, but was unworthy the serious thought of refined men and women.

Colonel Higginson's essay is to-day the keynote of a grand chorus in which men and women throughout the civilized world unite with ever-growing enthusiasm. Health is now the fashion. To cultivate the body is counted as essential to the best development as to fill the mind with learning. Every college has its gymnasium, every girls' school its regular system of exercise. Colonel Higginson is himself the president of the greatest 'cycle club in America, and in Boston a noble building for a ladies' gymnasium has just been dedicated under the auspices of the best society.

During the past five years a great advance has been made by the women of this country in the direction of physical culture. It is no longer counted unwomanly to use the same care in promoting health and vigor by intelligent exercise that one would use in developing literary taste or artistic skill by appropriate culture. The effect of this change is already seen in the growing strength of young women and their satisfaction in the ability to do things that would have crushed the belle of twenty years ago. Lawn tennis, rowing, horseback riding, tricycling, walking, and regular gymnastic training are in varying degrees popular among the women of to-day. They are found to be not only delightful in themselves, but of direct value in promoting health, strength, beauty, and happiness.

Among these, the tricycle is already recognized as the most useful and enjoyable means of bringing women into the open air and into contact with the attractions of nature. It is safe to say that five years ago there were not a score of lady 'cyclers in this country. Even in Europe there were few. To-day they are numbered by thousands, and hundreds of refined and cultured ladies are joining the ranks of riders every season.

The invention of the tricycle, and its rapid advance to the present state of mechanical perfection, is, I am firmly persuaded, the greatest boon to American women that the century has brought. Coming simultaneously with the conviction that "bodily exercise profiteth" much for womankind, it provides a way to take that exercise which is at once fascinating, graceful, invigorating, and healthful.

The tricycle is in the first place an economical vehicle. Its original cost is about the same as that of a very ordinary horse; but once bought and paid for, its expense of operation and keeping in order is almost nothing. Its diet is oil, its shoeing needs to be done say once in every twenty thousand miles, its repairs—if the machine is a good one—are trifling, and its daily care is not so great as that of a pet poodle. The machine may be kept in a front hall, a cellar, or a barn. It is always ready, by night or day. A chain and padlock will securely fasten it at the house of a friend, the market, or the church.

In the second place, it is mechanically adapted to afford the best possible exercise at the smallest expenditure of fatigue and nervous energy. The lady who mounts a tricycle with pedals and handles properly adjusted will be nearly erect on the pedals, and will use feet and legs very much as in rapid walking. At the same time the shoulders are thrown back, the lungs expanded, and through the action of the arms and the muscles of the back, the whole system receives constant but not exhausting exercise. The deep breathing that is a necessity for the tricycler is of great value to women in developing the strength of their lungs and the faculty of continued exertion. The whole body is more thoroughly exercised in riding a tricycle than in any form of exercise which I have ever tried, and yet so perfectly adapted to human needs is it that the fatigue of a ten mile ride is less than one would experience in walking a tenth of the distance.

There is a fragile woman in a neighboring city, who could not bear a carriage drive of half an hour without being prostrated with weariness. Her husband rode home one day a tricycle, in the faint hope that it might be of use to her. She rode a mile at the first trial, and came home refreshed. The machine was purchased, and I have known her to ride a dozen miles in a hot July day, with pleasure and advantage, when a walk of forty rods would formerly have exhausted her strength. She has been riding now for two seasons, is greatly benefited by it, and is making extensive plans for using a tandem tricycle with her husband, next summer.

The tricycle is unique, as far as I am aware, in that it affords the most thorough and pervasive exercise of all parts of the body, at the same time that the mind is so fully occupied with the care of managing the machine and enjoying the feast which nature spreads on every side, that one is conscious only of the pleasure, and gets the exercise as it were gratuitously. A ride over a pleasant country road in the early morning hours of a June day is an experience of rare delight. With a congenial companion the enjoyment is doubled. The fragrance of the woods and fields, the music of the birds, the exhilarating sense of rapid motion through the soft air, the free bodily movements, in which the tricycle seems only an added physical faculty, all go to make up an experience that, having once enjoyed, one is eager for a thousand times again.

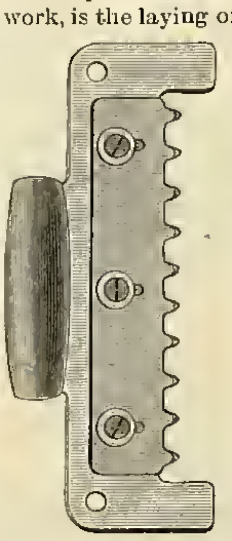
The practicality of the tricycle as a vehicle for the daily use of women is undoubted. There is scarcely a large town in the land where there are not some ladies who use the tricycle as others do their horse and carriage. It is always ready at the door for an errand to the market, a call on a friend, a spin for pleasure, or a journey to the next town. And where is the horse that, driven by his mistress, can be counted on for a uniform speed of eight miles an hour, with possibilities of ten or twelve on fine roads? The absolute independence which the woman with a tricycle has of mankind in every form, from the stable boy to her husband, is peculiarly gratifying to those who have always been compelled to wait the pleasure or convenience of the sterner sex.

The last two years has greatly developed the tandem tricycle in this country, which until that time was almost wholly used in England and on the Continent. Very good machines are now made on this side of the water, and their use is rapidly increasing here. The special advantage of the tandem is that it affords pleasant conveyance for a gentleman and lady, or two gentlemen, giving each equal use of the strength of both in propelling the machine. A husband whose wife is fragile and delicate may ride with her on a tandem, using his own superior strength to supplement her weakness in imparting an enjoyable rate of speed, which would be impossible for her on a single machine. The tandem is a social vehicle, and for touring is used with great pleasure and advantage. An easy rate of speed for a well made tandem tricycle is eight miles an hour, and it is not uncommon for a gentleman and his wife who live near my home to take an evening spin of two or three hours at the rate of twelve miles an hour. The touring in Italy and England of Mr. and Mrs. Joseph Pennell, on a tandem tricycle, has borne fruit in two of the most delightfully written and illustrated books of travel which have lately been published.

I have avoided in this brief paper giving figures, dates, and statistics concerning the use of the tricycle by women. They are accessible by every one who cares to know exactly what has been done. Any 'cycle maker or dealer will gladly supply such information on application. I have only amplified and illustrated the undoubted facts of the wonderful growth of the belief in physical culture among American women, and the unique adaptation of the tricycle, in its single or double form, for the promotion of that end in a manner at once pleasant, practical, and popular.—*William B. Howland.*

STANLEY'S ADJUSTABLE CLAPBOARD MARKER.

A very considerable part of an ordinary carpenter's work, is the laying of clapboards or siding. A difficult feature in this work has been the fitting of clapboards closely where they end, at the corner board or at window casings. The usual methods employed by workmen for marking and sawing off the boards, by use of a try-square and scratch-awl, or by aid of a clapboard-hook and scratch-awl, have demanded about one more hand than the average man has been supplied with by nature.

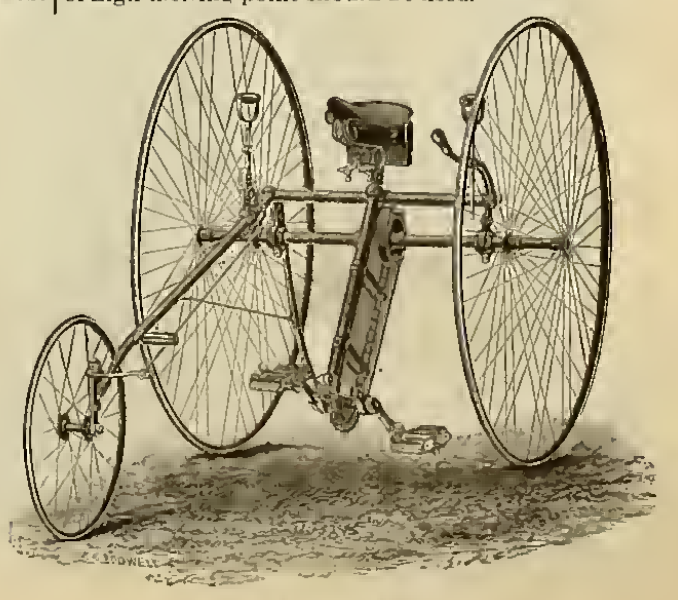


We illustrate on this page a tool which can be used with one hand, while the other is employed in holding a clapboard in position. The sharp edge of the teeth on the marking blade are just parallel with the outer edges of the legs when placed against the corner-board; and by moving the tool half an inch, it will mark a full line across the clapboard, exactly over and conformed to the edge of the corner-board or casing. There is then no difficulty in sawing for a perfectly close joint. The Stanley Rule and Level Company, of New Britain, Conn., are just now supplying hardware dealers with this excellent tool.

Impermeable Boxes.

Excellent water, air, and grease proof boxes can be easily made by immersing either paper, willow, or turned wood boxes in hot melted hard paraffin. Such boxes are very handy and useful for sending out ointments, pastes, pills, or anything of a hygroscopic or deliquescent character. They can be hermetically sealed by placing the lid on the box while warm. Mr. A. W. Gerrard, F.C.S., of University College Hospital, who communicates this note to the *Chemist and Druggist*, sends a specimen impermeable box. The appearance of the wood is little altered by the paraffin coating, and the box is perfectly water tight. Paraffin of high melting point should be used.

LADY'S AND GENTLEMAN'S TANDEM.



THE LADY'S TRICYCLE.

NEW METAL SHINGLES.

One of the most simple and effective means of adding to the appearance of those buildings in which the roof forms a conspicuous feature is to cover it in with

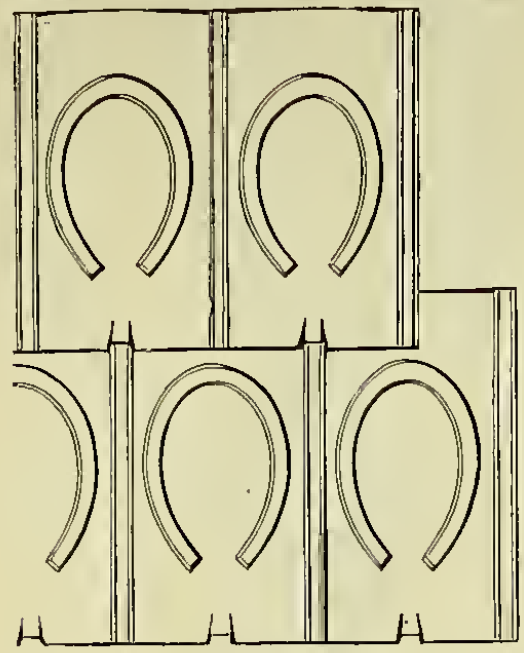


Fig. 1.

a material shaped to form some description of ornament. With this object are shingles and slates, having rounded or semi-octagonal ends, used to add to the effect.

The Thorn Shingle and Ornament Company, of 1201 Callowhill Street, Philadelphia, Pa., are the manufacturers of a variety of different shingles formed of sheet

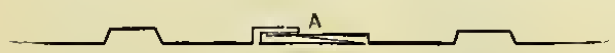


Fig. 2.

metal, which are very useful in giving a decidedly good appearance to the roof upon which they may be placed. One variety we show in the plate at Fig. 1, which indicates the manner in which they are laid upon the roof, and the general appearance they present. They are not inappropriately termed "The Horseshoe Spring Lock Shingle," from the shape of the figure embossed upon them and the description of the lock joint between adjacent shingles.

In all kinds of sheet metal shingles, the importance of the side joints being formed in such a manner as to entirely keep out the weather is great. As they are not laid doubly overlapping, as are slates and the ordinary wooden shingles, any admittance of water through the joints means a probable penetration into the building.

The diagram shown in Fig. 2 indicates the manner in which this is effected by the spring lock. At A is formed a double groove, and, in addition, the edge of the sheet is turned over nearly upon itself, forming a spring edge pressing in an upward direction well against the other edge of the shingle, which enters the before mentioned double groove This system is found very effective in producing a water tight joint, and, at the same time, it is so simple that the shingles may be most expeditiously laid.

Among the other designs of shingles turned out by the same company are those having hexagonal, lozenge shapes, and other forms embossed upon them. They are made in various sizes, are supplied either painted or unpainted as may be required, and are usually shipped in boxes containing sufficient to cover one square.

JOINT FOR WOODWORK.

The Tagg system of jointing woodwork consists essentially in soaking a long strip of canvas, or similar fibrous material, and lengths of spun cotton yarn, in a particular kind of vegetable gum, to form the material of

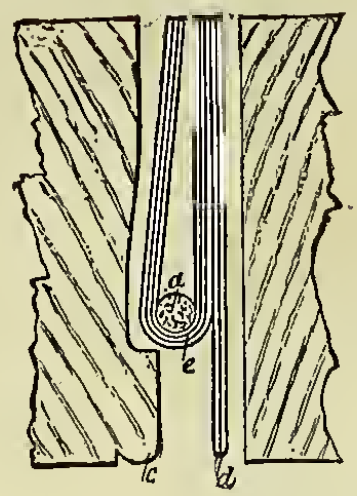


Fig. 1.

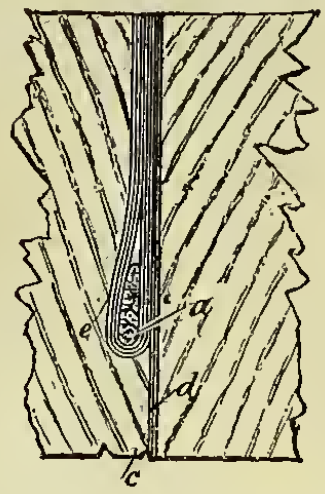


Fig. 2.

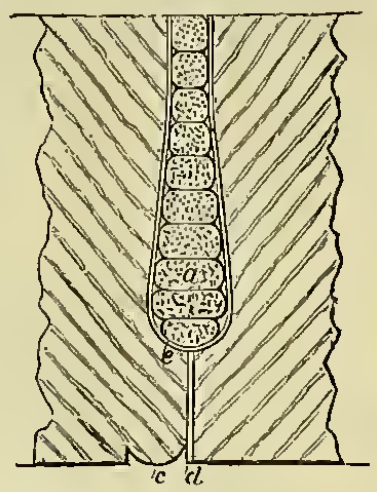


Fig. 3.

TAGG'S JOINTS FOR WOODWORK.

By writing to the Thorn Company, those of our readers who are interested may obtain a useful catalogue illustrating the various designs.

FURNACE HEATING FOR HOUSES.

The Fuller & Warren Company, of Troy, N. Y., with stores at New York, Chicago, and Cleveland, Ohio, has long held a leading position among manufacturers of stoves and heaters. In fact, the business of which this firm is the direct successor was founded more than half a century ago, and its managers have, for the long period since that time, been continuously in the front rank in introducing the improvements which have been steadily brought forward by inventors and experimenters for the advancement of this industry.

Among the specialties made by this firm that are particularly worth noting by house builders and architects are their top return flue heating and ventilating furnaces, constructed upon thoroughly scientific principles, and embodying the results of their long experience. The manufacturing facilities of the firm are such that excellence of workmanship has long been a distinguishing characteristic of their goods, a feature which is well exemplified in these furnaces, and which not only insures their durability, but is, in connection with their correct design, promotive of exceptional economy in their consumption of fuel. One of these furnaces is illustrated in the accompanying engraving. It is claimed to be absolutely gas tight, and to have fewer joints than any cast iron heater made, giving a complete control of the fire and a perfect combustion of the gases. In making the various parts of this furnace, the expansion and contraction of the metal at various degrees of heat have been so carefully calculated that the fire has the same effect over all parts, whether at a high or low temperature, and all exposed joints are protected by packing with a cement of their own manufacture, which becomes, after a time, a part of the iron itself.

TOP RETURN FLUE HEATING AND VENTILATING FURNACE.

This furnace is self-cleaning, care having been taken that there shall be no angles to accumulate ashes or soot, and the grate is made with a slide center, by which it can be thoroughly cleaned without opening the door. The dust flue connects directly with the exit pipe, and has an automatic slide that acts in connection with the anti-clinker door, which, when open, draws the dust flue slide, and closes it again when the door is shut. Direct draught can be had when desired. The ash pit is of unusual capacity, and the flues are so arranged that all parts of the furnace in contact with the fire are heated thoroughly and alike, and the products of combustion as entirely utilized before passing to the exit flue. There is a damper in the ash-pit door, insuring complete control of the fire; the admission of air under the fire and through perforations in the feed door, the openings in the grate, and the size and shape of the combustion chamber, fire-pot, radiator, and flues being all carefully graduated to insure perfect combustion, and in accordance with a knowledge of the laws governing the principles of heating by warm air. Careful attention has been given to the height of the furnace, to accommodate cellars with low ceilings, and also to insure proper elevation for warm air pipes; and during the spring and fall months, when very little heat is required, it can be easily obtained at a very moderate expense with this heater.

the joint. The strips are folded up into as many plies as may be necessary, according to the depth of the joint, then applied to one edge and held there while the other plank is pushed up and nailed down.

Figs. 1 and 2 show the various members of a deck joint, respectively before and after the joint is made. One plank has a plain edge, the opposite plank has a longitudinal cavity and a closing bead, *c*. The plies of canvas, *e*, have been previously saturated, and receive in their hight a saturated core, *a*. One two-ply length of canvas, *d*, completes the material of the joint. No special devices are required for closing up the planks; they are laid in the ordinary way. For thin decks the core, *a*, is dispensed with, and both plank edges are plain, there being the same number of layers of canvas for the whole depth of the joint.

Fig. 3 illustrates another type of joint, the bulk of the jointing material being saturated cores instead of strips. This type of joint is peculiarly well adapted for remaking old seams without disturbing the planks. No calking is required, and no calking tool is used. Consequently the edges of the timbers are not injured, but are left as sharp as when they came from the planer. The cores of Fig. 3 are rolled into the trough between the two planks by means of a roller with a serrated edge.

There is no exudation of the gum upward. The closing strip, *c*, prevents any droppings, and the lines of the jointing are scarcely perceptible.

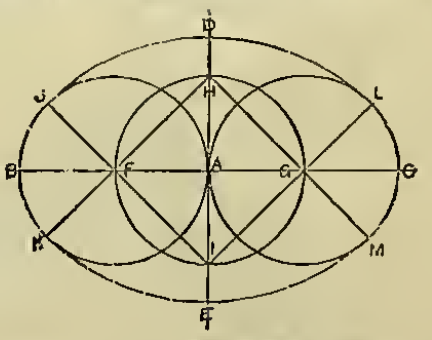
The material of the Tagg joint, says *Engineering*, gives and takes with the shrinking and swelling of the planks through the whole depth of the joint, without separating from the edges, for the canvas strip adheres to the plank edge so closely after the gum has dried that it will resist a straight pull of 4 lb. per square inch.

This joint has been tried on the decks of the steamship Glengarry for the double trip to China and home again, *via* the Suez Canal, and stood the severe test of the intense heat of the Red Sea thoroughly well. Samples from the Glengarry can be seen at Lloyd's, 2 White Lion Court, Cornhill, E. C.

This invention is applicable to many other purposes besides decks and other parts of ships, and can be used with advantage in many forms of constructional work. The process of manufacture can be seen at the inventor's, Island Boat Building Works, East Molesey.

EASY METHOD OF MAKING AN ELLIPSE.

At the point. A, let two straight lines, B C and D E, cross each other at right angles. From the center, A,



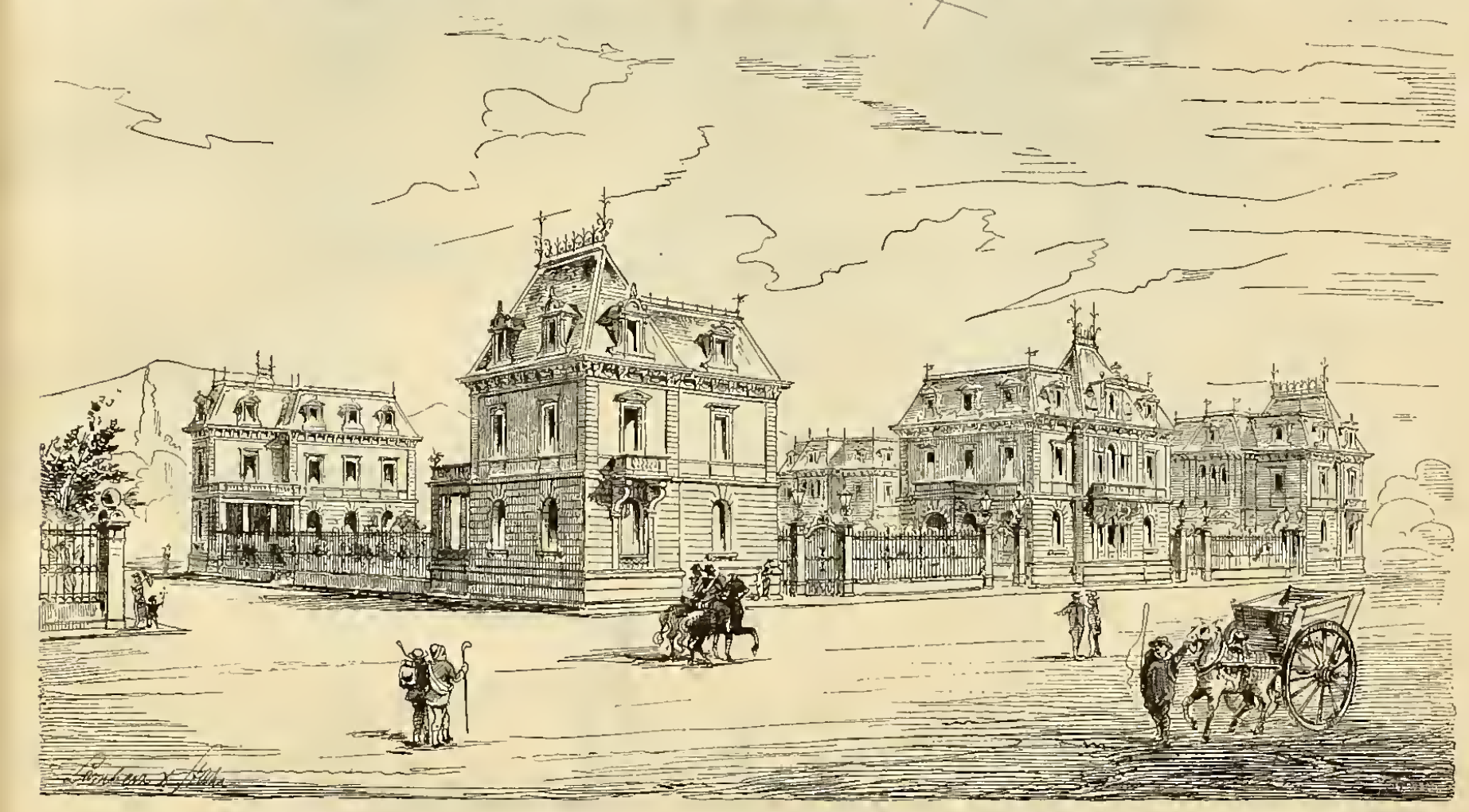
draw a circle, F G H I; and from F and G draw two other circles of the same circumference as F G H I.

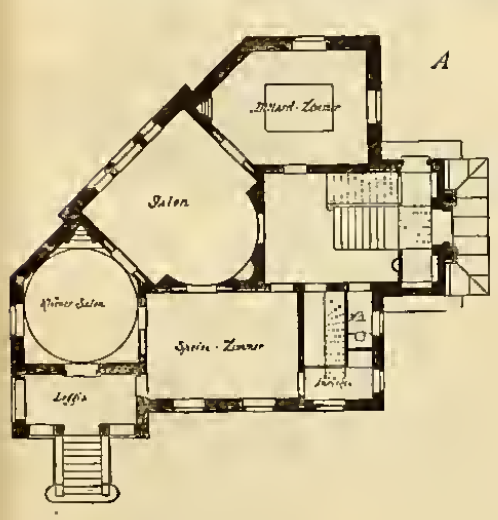
From the points H and I draw four straight lines through the points F and G to the points J, K, L, and M. Then from the centers, H and I, draw the arcs, J D L and K E M.

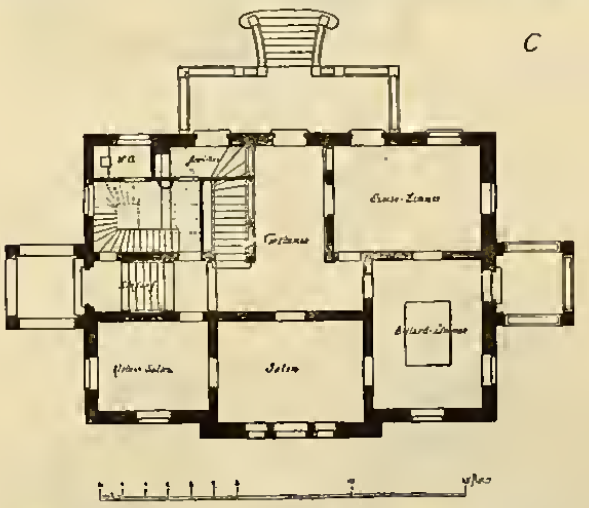
An ellipse of any size may be produced by making the diameter of the first circle half the length of the desired ellipse.—*H. C. Crew, English Mechanic.*

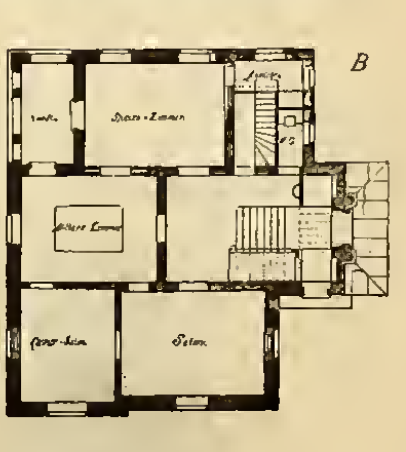
SUBURBAN DWELLINGS IN ITALY.

We give from *Architektonische Rundschau* a group of suburban dwellings erected near Turin, Italy. They are from the designs of L. Neher, architect, Frankfort Tbese buildings are quite attractive in appearance and the grounds are tastefully laid out.









GROUP OF ITALIAN DWELLINGS.

Algaborilla.

Husks known under the name of algaborilla contain a tannin-like substance, which can be used for dyeing yellow. The trees from which these husks are obtained are the Prosopis pallida and the Prosopis algarobo, which occur in the mountainous districts of South America. The seeds form about one-fifth of the weight of the husk, but contain no tannin. The husks contain about 27 to 29 per cent of the tannin. The coloring matter yields yellow precipitates, with salts of tin, antimony, lead, or alumina; the tin compound is the brightest. For dyeing yarn, the latter is mordanted with tin, as usual, and placed in the dye bath, which contains water heated to boiling and about 7 to 10 per cent of algaborilla. After working the yarn in the bath for some time, the bath is left to cool, and the yarn afterward washed and dried. The color is not as brilliant as that obtained with fustic, but more of a straw color; it is, however, pretty fast, and resists weak acids; alkalies change the color into brown. With iron mordants, good grayish black shades can be produced, and 5 to 7 per cent of the husks will be sufficient for the bath. Wool can also be dyed with algaborilla.

Steam Pipe Coverings.

The necessity of covering steam and heat conveying pipes with a non-conductor, both on the score of economy and in preventing the damage of fire, is now generally understood.

It is a fact, however, as Professor Gibson, in his report to the Western Manufacturers' Insurance Association, remarks, that "No combination, however successfully prepared will prove a perfect preventive against loss of heat by radiation; but the covering which possesses in the greatest degree the qualities of non-conductibility, incombustibility, and durability will, in the end, prove the cheapest, even if the first cost be comparatively high."

Examined by this somewhat severe standard, the pipe coverings of the Magnesia Sectional Covering Co. appear to rank high in degree of excellency. The nature of the material is well calculated to resist the action of heat and to prevent radiation. It remains unaffected by any heat below 2,000° F., and is very light and durable, averaging 1⅛ lb. to the lineal foot for a 2 in. pipe. An even more important advantage of this covering is that, unlike many others, it does not, to the smallest extent, affect or destroy the pipes.

The coverings are made in the form of hollow cylinders, divided into two longitudinally, and jacketed with canvas or other suitable material. They are secured to the pipes by metallic bands, which accompany each section

Full information concerning these coverings will be given, on request, by the manufacturers, the Magnesia Sectional Covering Co, No. 9 North Fifth Street, Philadelphia, Pa.

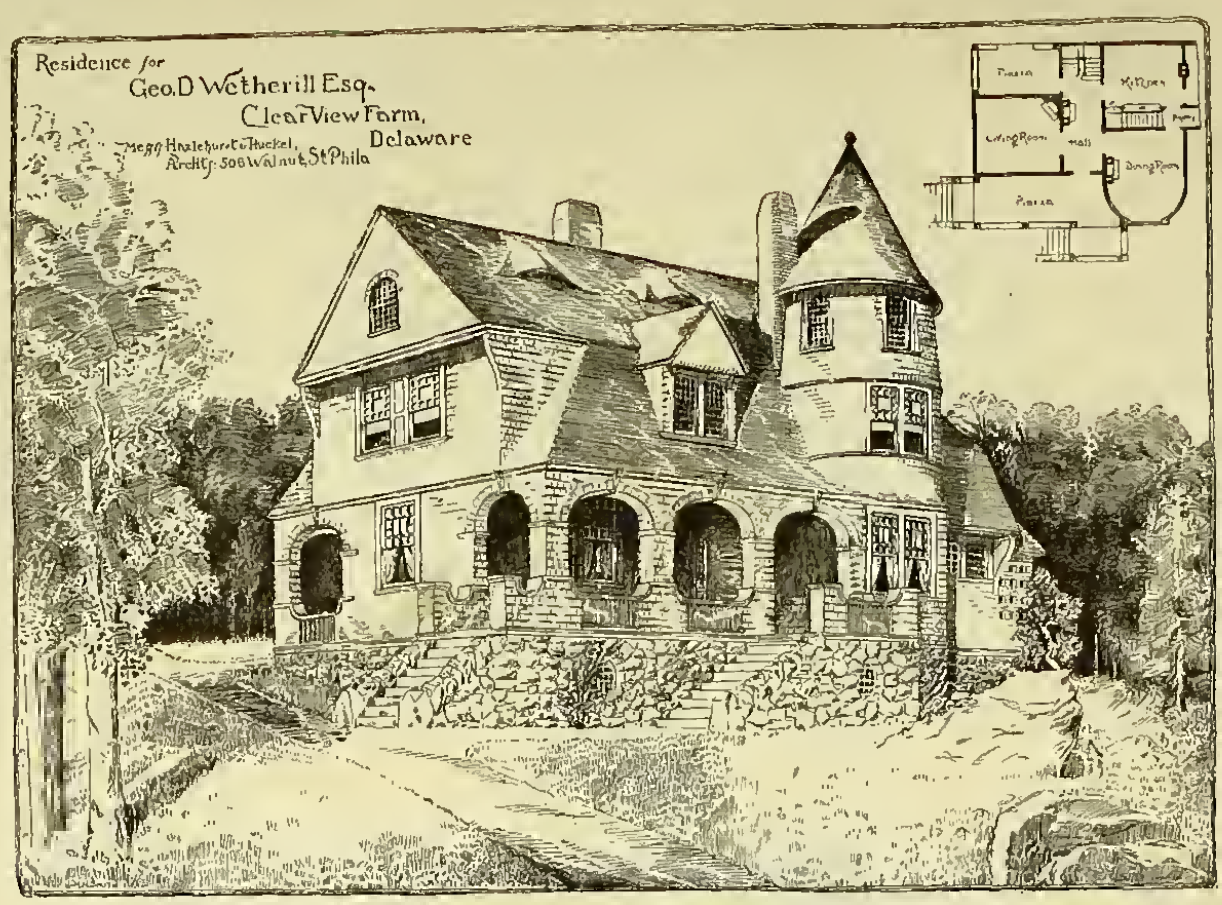
Protection of Buildings from Lightning.

The French Minister of Public Instruction recently submitted to the Academie des Sciences an important question concerning the fitting of lightning conductors for public schools and other large buildings. It appears that a departmental commission represented to the minister that it was necessary in a particular case to connect all the iron stairs and other internal metal work of a school building to the lightning conductors, so as to prevent the danger of lightning leaving the outside conductors and striking through walls or roofs at the insulated metal inside. The minister logically concluded that if this was done for one building, it should be done for all similarly circumstanced; and as this action would involve the expenditure of a considerable sum, he asked the opinion of the Academy upon the point.

The committee to whom the question was referred have reported to the effect that it is indispensable for the perfect protection of buildings from lightning that the conductors should be well connected with all important metallic masses inside. The case applies not only to iron in roofs, partitions, or staircases, but also to gas and water pipes, heating apparatus, and similar metallic fittings. It is laid down also that where there are many lightning conductors attached to a building, the nearest of them should be placed in connection with the metallic masses in question. It is understood on the part of the committee that the lightning conductors themselves are always properly "grounded," by being put in perfect connection with the earth by means of a well which is never dry.

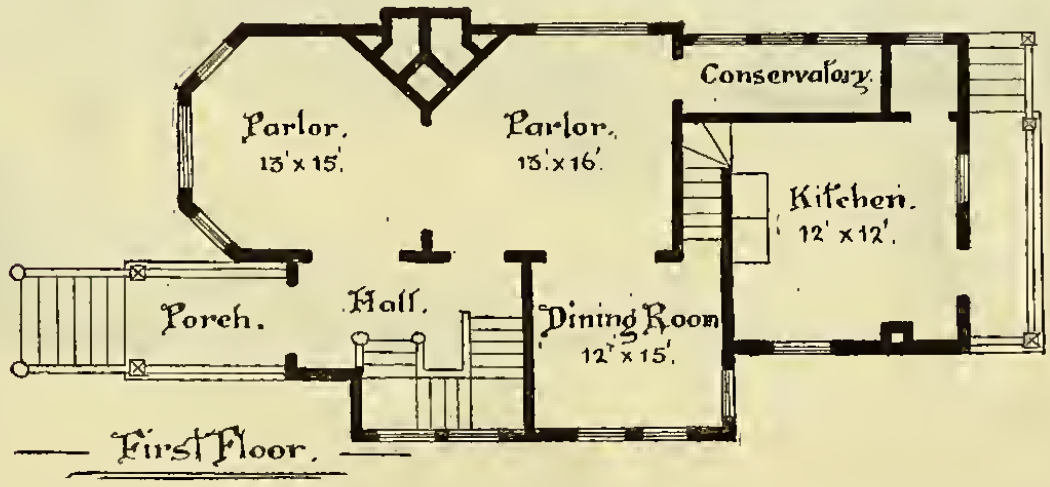
This general method of increasing the factor of safety in buildings, in case of lightning stroke, has been advocated in the SCIENTIFIC AMERICAN for the past twenty-five years, and we believe was first publicly suggested in these columns. We have repeatedly shown how faulty, if not useless, is the ordinary lightning rod system, where the lower end of the rod is simply stuck a foot or two into the dry ground; and we have urged, first, that the rod must have a thorough and extensive conducting surface in contact with the earth; second, that all metallic fittings both within and without the building should be connected with the rods, or with special rods leading to the ground terminals. Where there are underground metallic pipes, such as water, gas, or drains, the rods should be connected with them. If there are no such metallic pipes or masses, then long trenches leading away from the building should be dug, deep enough to reach moist ground, pulverized coal should be placed in the bottom of the trenches, and the lower end of the rod extended for a considerable distance in the trench in contact with the coal, which is itself a conductor.

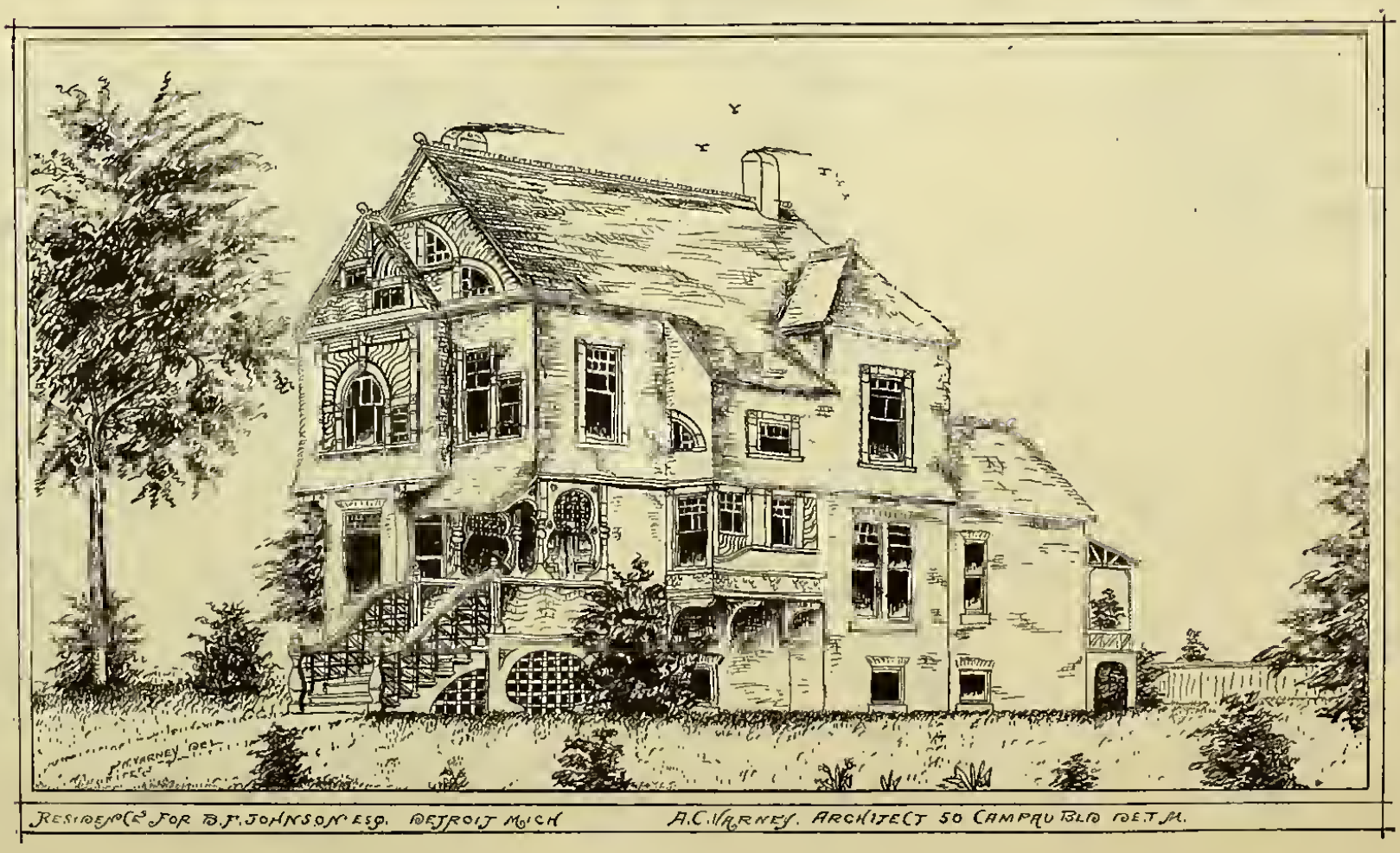
A SASH holder has been patented by Mr. James P. Hendrick, of Flemingsburg, Ky. The catch bar of the holder consists of a lower portion to be secured within the outer sash groove of the window frame and an upper part which has an outward top or head plate, with various other novel features, making a device which can be readily applied, and will hold the sashes open at either the top or bottom, or at both places.



A DELAWARE RESIDENCE.

[For description see page 55.]



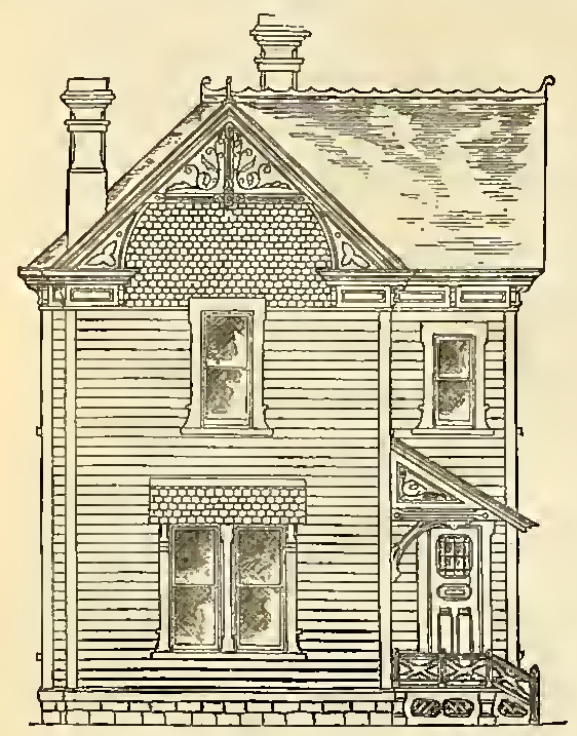


A $2,600 RESIDENCE AT DETROIT, MICH.

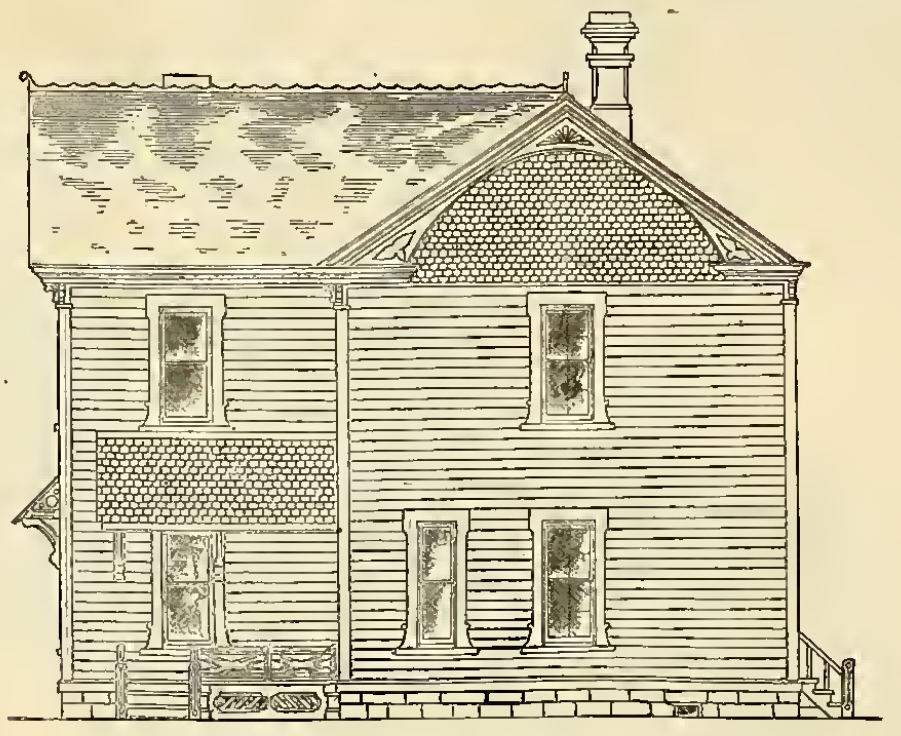
[For description see page 59.]

A ONE THOUSAND DOLLAR COTTAGE.

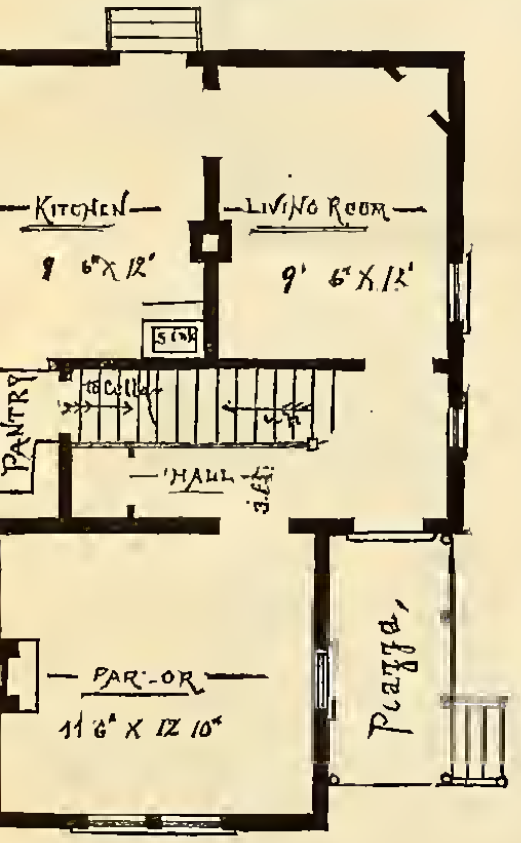
he cost of erecting this house, according to the mate of the author of the plan, Mr G. Goldstone, of onto, Canada, is only $997.35; and as the rooms are nodest dimensions (though sufficient for the needs small family), and the ceilings of the first and nd stories respectively 8¼ and 8 feet high, the gn can no doubt be carried out for that sum. With e latitude in point of finish and quality of material work, however, it might easily cost $1,200, and we ld be inclined to place the estimate at that figure thoroughly satisfactory job. This view of the is especially suggested by the fact that the general gn of the house, as shown by the elevations, is of a ewhat decorative character; and to be in keeping its tasteful exterior, some liberty should be allown the inside work beyond what mere necessity is built of field stone, or bowlders, laid in random courses pointed with dark cement mortar. The house above the foundation is of wood, and the exterior is entirely covered with shingles. On the first floor there is a large hall running through the house, with a square staircase at the end lighted by a large stained glass window. The hall contains also an open fireplace and wide doors entering a living room on the left 14' × 16', and dining room on the right 14' × 17', each having a fireplace. From the hall the kitchen is also reached, which is 12' 6" × 14', with a pantry between dining room and same, and a summer kitchen, etc., in the rear. The second floor contains three large chambers; bath-room and servants' quarters over kitchen and pantry, etc. The main staircase stops on second floor. The private staircase starting in kitchen continues up to attic, which contains a bed room, tank room, and tower room. The roof is painted a light brick or tile color, the shingles on sides a light yellow buff, with a darker trim color for cornices and string mouldings; black sash. The cost of the building is about $4,000 complete.—*Building.*



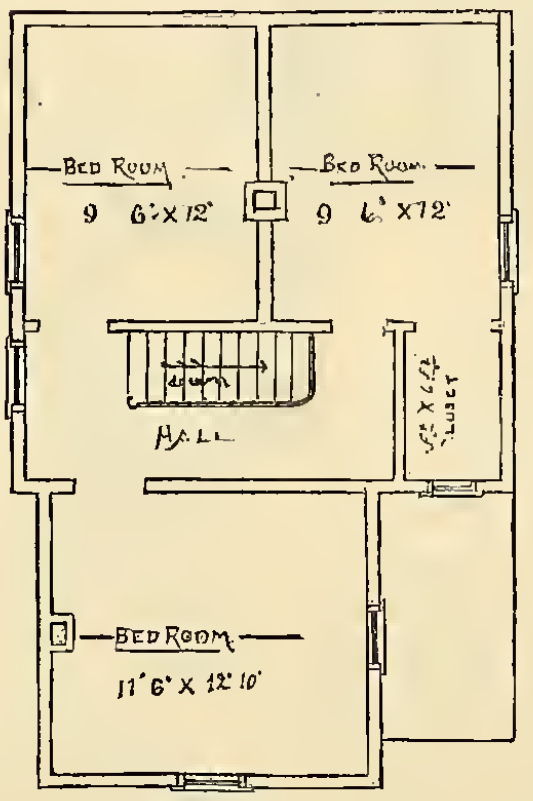
FRONT ELEVATION.



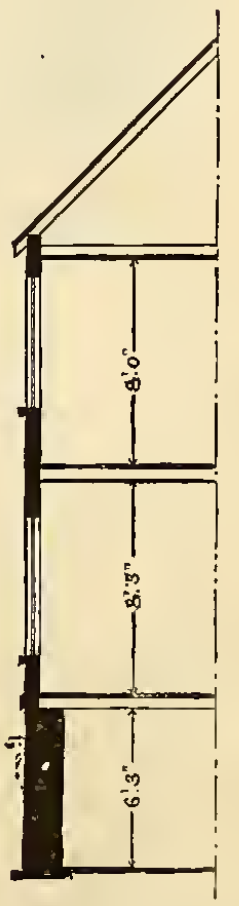
SIDE ELEVATION.



First Floor Plan



Second Floor Plan



A ONE THOUSAND DOLLAR COTTAGE.

ld require. If, however, absolute plainness in the li be adhered to, the house can be built for the unt named by the author of the plan, and in some s of the United States for even less.

suburban lot of 25 feet front is quite sufficient for use on this plan, and where lots are procurable for to $20 per front foot, an attractive home may thus made at a cost not exceeding $1,500 to $1,800.—*Mechanical News.*

A DELAWARE COUNTRY RESIDENCE.

esidence for George D. Wetherill, Esq., Clear View m, Delaware. Hazlehurst & Huckel, architects, Walnut Street, Philadelphia.

his cottage is built about twenty-five miles from adelphia. It stands on a slope of a hill commanda view up the Delaware River and surrounding ntry for twenty miles. Above the natural grade, ch has been but slightly changed, the foundation

Impure Ice as a Cause of Disease.

The State Board of Health having been asked by the Board of Health of Syracuse to examine into the purity of ice taken from Onondaga Lake, from the Erie Canal at Syracuse, and from Cazenovia Lake, has not only made a careful investigation into the quality of ice from those sources, but has also prepared a report on the general question of the pathogenetic powers of contaminated ice. The board comes to these conclusions: Ice formed in impure water has caused sickness; it may contain from eight to ten per cent of the organic matter dissolved in the water, and, in addition, a very large amount of the organic matter that had been merely suspended or floating in it; it may contain living animals and plants, ranging in size from visible worms down to the minutest spores, and the vitality of these organisms may be unaffected by freezing.

Analyzed the Ashes.

Two barns said to be filled with unthrashed wheat were recently burned in Germany. They were insured, but it was impossible to collect, because the claim was made that the contents of the barns were simply straw. When the affair got into the courts, chemical experts were called to analyze the ashes. Wheat contains a large quantity of phosphoric acid, almost ten times as much as does straw. Naturally, in the burning of these barns, wood ashes, cement, and other mineral substances were mixed with the ashes submitted to the chemists, but none of these admixtures contains phosphoric acid. The experts found that of two samples placed in their hands, one contained 10·2 per cent and the other 1·9 per cent of the acid, thus proving conclusively that the farmers were in the right, and the insurance companies, as is generally the case, according to public sentiment, in the wrong.—*Fireman's Herald.*

A SUBTERRANEAN water collecting dam has been patented by Mr. David H. Valentine, of Brooklyn, N. Y. The dam is combined with a conduit upon its source side, the dam and conduit being built from a central point or reservoir in a valley, up an elevation or hillside, and serving to intercept the earth flow of spring water through gravelly soil to the ocean or any watercourse.

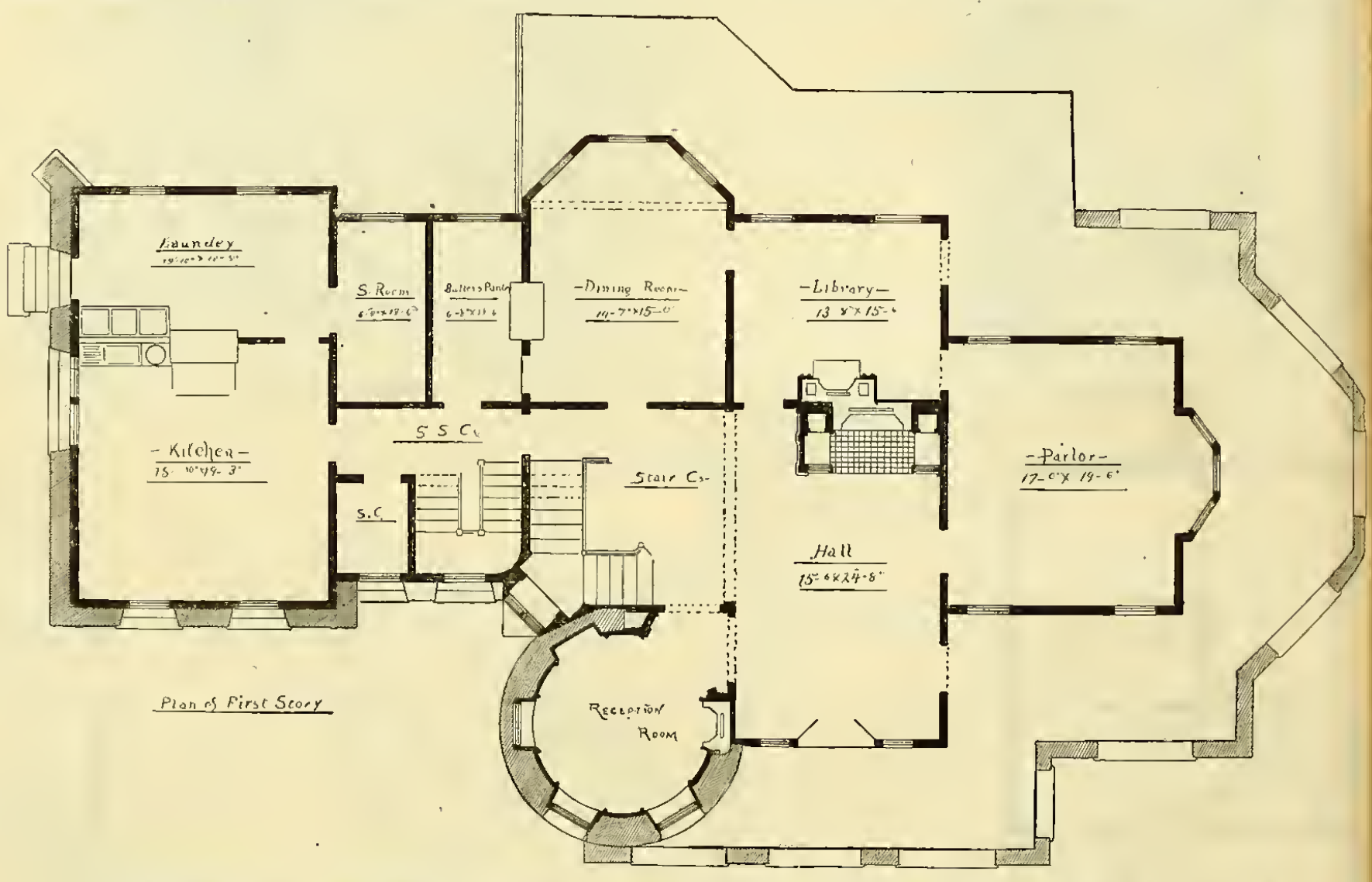
REMODELING A HOUSE.

It frequently happens in the experience of the architect that he is called upon to enlarge or remodel a dwelling. Sometimes it is only required to add one or more rooms, while in other cases it is sought to improve the appearance of the exterior. Such problems often severely tax his ingenuity, for it becomes difficult to considerably improve the appearance of a building while substantially maintaining its original outlines.

As illustrating what may be done in this direction, we present to our readers a set of drawings, showing the ingenious and clever method of treatment adopted by Architect Howard Hoppin in dealing with the residence of Mrs. R. M. Clark, at Pomfret, Conn. This house before alteration presented the appearance of a comfortable, plain, country dwelling, as represented in the view in the upper right hand corner of our plate. The imposing appearance of it as it now stands can be seen from the large perspective view.

The alterations, although apparently so extensive, were, in fact, few beyond the addition of towers, the stone lining to some of the walls, and the new piazza. Scarcely a feature of the original house has been removed. It has simply been added to, and this in such a manner as to throw but little weight upon the old work.

We show a number of details of the construction, and give below a complete specification of the work, which cost about $7,000 to carry out. Mr. Hoppin's address is 33 Westminster Street, Providence, R. I.



ALTERATIONS AND ADDITIONS TO A COUNTRY HOUSE AT POMFRET, CONN.—HOWARD HOPPIN, ARCHITECT.

MASON'S WORK.

Excavate and remove to place shown on lot all soil for air space under tower, for trenches, for all new walls, chimneys, piers, and foundations, as shown. Trenches for tower and stone walls at L to be dug below cellar bottom. Trenches for new porch and foundations, outside of walls, to be dug 4 ft. below grade.

Footings.—Bed on solid bottom, good footing stones under all walls, piers, and chimneys.

Foundation Walls.—To be of stone under all walls, piers, and chimneys, laid in lime mortar, pointed up on outside.

Repairing Old Cella Walls.—Take down old cellar walls where unsound or unsafe, and rebuild like other walls. Jack up house where sagged, and finish all securely. Point up old cellar walls where repaired, and leave in good order like other old walls. New foundation walls, outside, to run from footings to six inches below grade. Upon said foundations, 6 in. below grade, build stone walls of sizes, shapes, and dimensions shown. Said walls to show a rough random rock face, and to be carefully laid in lime mortar, and pointed up with sunk joints of cement—half and half mortar—at end of job. Stone walls of porch and piazza columns to be dressed off with hammer to curves as shown. Reset stone step at porch, with good solid foundation under.

Sills.—Set all stone sills.

Lintel Arches.—Turn lintel arches over windows of tower. All stone for building to be supplied by owner. The contractor to dress and set same in best manner. Build stone bases for piazza columns, as and where shown, from 4 ft. below grade to base of wooden columns, with batter all around, and corners dressed off to round.

Chimneys.—Build new chimneys in tower, of good hard body brick from foundations to under side of roofs or connections with piping as shown. To be brought up through small tower to ceiling of third story, each floor to be fitted to round 10 in. tile pipe with easy bends; from said bends run up lines of 10 in. tile pipe with incline of roof, to and through copper tower top.

Fireplaces.—Build three fireplaces in tower as shown, of good hard body brick, laid in red mortar.

Flues.—All tower flues to be 8 in. by 12 in., and parged from top to bottom. All new chimneys where not surrounded by stonework to be plastered on outside from top to bottom. In second story bed-room over hall to corbel out and to build brick backing in corner as shown, 5 ft. high from floor, with 6 in. tile from face of same to flue, 4 ft. from floor.

Trimmer Arches.—To be buried under all tower fireplaces.

Hearths.—To be of hard body brick to all fireplaces of tower.

Lead Flashing.—Of 4 lb. lead on all chimneys where coming through roofs.

Note.—Carpenter is to furr all stone walls and all ceilings.

Lathing.—To lath walls and ceilings of whole of tower, and other parts of house where required. All laths to be of good spruce 4 feet long, and securely nailed.

Plastering.—Plaster the whole of the above, and patch up through whole of house all cracks and broken places. First coat to be a good thick coat of hair mortar. Finishing coat of lime, putty, and plaster of Paris. All plaster to be slaked for a week before using.

Outside Plastering.—Upon wire netting, supplied and put on by carpenter, put a heavy coat of stucco (half lime and half Portland cement) well pressed into spaces of netting. Before this coat is set, press in bottle ends, glass, pebbles, etc., as directed. Glass, etc., will be furnished by owner.

CARPENTER'S WORK.

Timber.—To be of good, sound quality, of sizes as follows: Tower floor joists, 2 in. by 9 in. (16 in. on centers); porch floor joists, 2 in. by 9 in. (16 in. on centers); porch ceiling joists, 2 in. by 9 in.; tower ceiling joists, 2 in. by 10 in. and 6 in. by 10 in., as shown, alternating, 6 in. by 10 in. joists to be of hard pine, others to be of spruce; tower rafters, 2 in. by 10 in. (24 in. on centers); small towers and dormer rafters, 2 in. by 6 in. (24 in. on centers); L roof rafters, 2 in. by 9 in. (24 in. on centers); sills, 4 in. by 6 in.; sill at top of main tower, 4 in. by 6 in.; posts, 4 in. by 6 in.; plates, 4 in. by 4 in.; studs, 2 in. by 4 in. in. on centers); studs at top of main tower th 6 in. by 10 in. joists to be 4 in. by 6 in hard pine.

Ties.—Across main tower, 1¼ in. by 6 in. spruce.

Crossbridging.—To crossbridge ceiling joists of t story tower room with 2 in. by 4 in. crossbridging three parallel lines, carefully spiked to joists. Cr bridge floor joists of tower in one line across s in center with good spruce scantling.

Cutting and Jobbing.—Do all necessary cutting, ting, and jobbing for other workmen on the build and leave space of 2 in. around new chimneys. S same, taking care not to drive nails into same.

Cover new roof sides and floors with good ⅞ hemlock boarding.

Sheathing Paper.—Before laying upper floors putting on outside finish, cover boarding of floors sides with one thickness of sheathing paper over ping.

Tinning.—Cover roofs of front porch, flat part south dormer, and new roof over entry to tower third story with first quality M. F. I. C. terne Also under sides of roof boarding and both sides rafters, next to tile flue piping on tower, up length in best manner.

Flashing.—With same tin on all new hips and rid valleys, and chimneys, also over all exposed d and windows, over stool under third story tower dows, and wherever else is necessary.

Shingles.—Cover all new roofs and patch up roofs where necessary with shingles of same qu as old shingles. Cover sides of building over c boards with curves of first quality sawed cedar shi 4½ in. lap.

Clapboarding.—Repair old clapboards where n sary, and leave in good order.

Furring.—Furr out all stone walls and all ce where plastering is to be used with good ⅞ in. scan

Wire Netting.—Cover outside where outside pla ing is to be used with heavy wire netting ⅜ in.

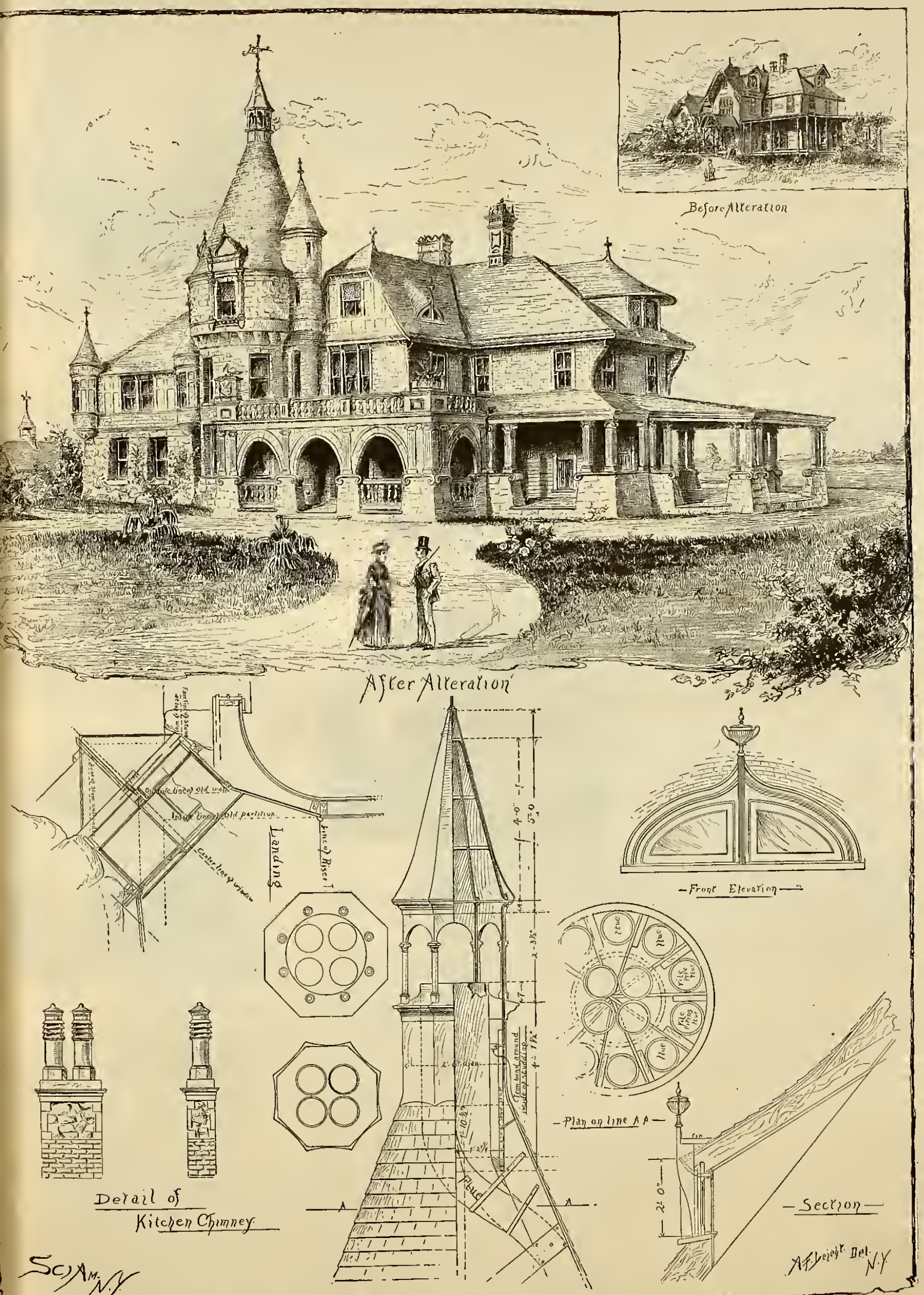
Iron Ties.—Put on iron ties to outside walls w are to be faced with stone, 18 in. apart, both ways

Gutters.—To frame a gutter around and in ⅞ main tower, and to line same with first quality tin to main roof with strap irons and tin to run 12 in roof. Put up wooden gutters like old gutters of h on new roofs to kitchen, with good pitch to ou and line with first quality tin.

Conductor Head.—Put good conductor hea tinned roof over entry to third story tower roo front gable end, lined with tin. Look over old gu and leave all in good working order.

Conductors.—Of 3 in. tin to ground. One line at gable end, one line by stair-case bay window, an line at each end of kitchen.

Upper Floors.—Lay upper floors of first quality ⅞ in. thick, matched on floors of main tower a other parts of new addition. Lay first quality fl hard pine on porch and connection between porch



ALTERATIONS AND ADDITIONS TO A COUNTRY HOUSE AT POMFRET, CONN.—HOWARD HOPPIN, ARCHITECT.

piazza as shown. All flooring to be carefully laid and blind nailed.

Frames.—New window and door frames of good white pine on all towers, stair-case hall (two stories), front hall, side windows, and two south dormers, frames and sash of kitchen L to be cut down as necessary.

Sashes.—To be of sizes and shapes as shown, of first quality white pine 1¾ in. thick. Sash of eyebrow dormer to be hung at side with good snap catches on each sash. All other windows to be weighted in best manner.

Glass.—Of first quality, like glass in rest of building.

Doors.—Of sizes and shapes given. Front doors to be repaired and covered on outside with first quality San Domingo mahogany ⅝ in. thick, perfectly plain, without panels or mouldings. Inside of front door not to be changed. Coat closet doors and reception room door to be of ash, like other doors opening into front hall. All other new doors to be of first quality white pine, like other doors of house.

Hardware.—To be like old hardware.

Finials.—Put up eight finials to roofs, and allow $50 for cost of same.

Dormers.—Take off north and south (front) dormers entirely, and put south (front) dormer on new, and change south dormer, as shown.

Piazza Jet.—Case in piazza jet as per details, with friezes inside and out. Mouldings of same to join flush with string course around house.

Copper Tower Top.—Make and put up a top to tower, as shown, of first quality copper, with floor and ceiling of copper. Floors to turn up over chimney flues, so as to prevent leakage. To be attached to roof, with all necessary irons, bolts, etc.

Outside Finish.—Of first quality white pine. Get out and put on heavy mouldings around casings of windows, etc., where at shingles, stone, or new work. Burr out gable ends and around kitchen L, as shown, with brackets, mouldings, and finish as shown.

Half Timber Work.—At outside, plaster to be of ⅞ in. stock over furring strips, and plaster. Furr out at third story of main tower and on small towers with corbels and mouldings.

Piazza Columns.—To be cut off at new stonework, and to be cased with grooved casings and with caps and bases, as per details. Flat columns to be of 1¼ in. stock, grooved, and with capitals and bases, as shown.

Balustrade.—Over front porch of 1¼ in. stock sawed and chamfered out, and with half turned column on outside. Turn moulded arch at front porch, with carved brackets under. Octagonal bases over columns on front porch to be gotten out, with strong top to hold vase of flowers, top to be covered with tin.

Steps.—Put on nosing to floor of front porch, and piece out piazza with curve and with nosing and base like other parts of piazza. Replace steps to kitchen door in best manner. All woodwork inside of bays and landings of first quality ash.

Sheathing.—Sheathe the overheads of front porch and under overhang of south dormer window with ⅞ in. matched and beaded white pine sheathing with bed mould.

Blind Window.—Frame in blind window in main tower with frame and outside blinds like other windows.

Outside Blinds.—To all new windows, except landing windows and eyebrow dormer, to be like other blinds. Blinds to windows with stone jambs to have long arm hinges, so as to swing back clear from same.

Inside Finish.—All inside finish for house to be of material and like other parts of finish; that in first story front hall of first quality ash.

Closets.—To have 12 double wardrobe hooks.

Picture Mouldings.—Put on 1½ in. picture moulding to second and third stories of tower ¼ in. below ceiling, and 3 in. picture moulding and cap on walls of reception room at ceiling.

Tank.—Build and set a tank in roof of tower of 1¼ in. matched white pine. Same to have four hoops of strap iron 1 in. x ¼ in.

Scuttle.—Build and put up a scuttle in roof of main tower at tank, with cover hung on heavy strap iron hinges. All to be carefully flashed and arranged with ladder on outside, so as easily to get at same.

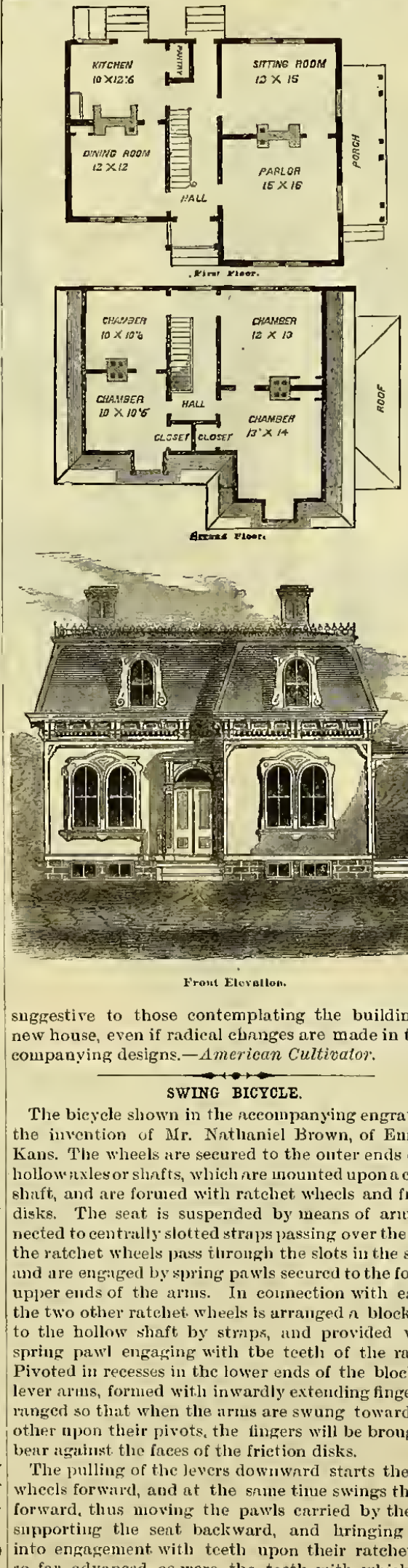
PAINTER'S WORK.

Outside.—Paint all roofs of house with first quality, leaving the whole at end of job clear and even. Give all shingles (except on roofs) one coat of Cabot's creosote stain, of shade selected by architect. Give all clapboards, conductors, gutters, blinds, metal, and outside finish two coats of first quality paint, in such colors as the architect may select. Give ceiling of porch and overhang of south dormer one coat of shellac. Give porch and piazza floors one coat of raw linseed oil.

Inside.—Give all ash (and mahogany on front door) one coat of good filler. All ash an extra coat of shellac. Rub down mahogany of front door with pumice stone and oil, and leave same in fine dead finish. Paint woodwork of tower rooms with two coats of first quality paint, in such colors and shades as the architect may select. Owner to do all extra painting inside.

A MANSARD ROOF DWELLING.

The principal floor of this design is elevated three feet above the surface of the ground, and is approached by the front steps leading to the platform. The height of the first floor is eleven feet, the second ten feet, and the cellar six feet six inches in the clear. The porch is so constructed that it can be put on either the front or side of the house, as it may suit the owner. The rooms, eight in number, are airy and of convenient size. The kitchen has a range, sink, and boiler, and a large closet, to be used as a pantry. The windows leading out to the porch will run to the floor, with heads running into the walls. In the attic the chambers are 10 ft. by 10 ft., 13 ft. by 14 ft., 12 ft. by 13 ft., 10 ft. by 10½ ft., and a hall 6 ft. wide, with large closets and cupboards for each chamber. The building is so constructed that an addition can be made to the rear any time by using the present kitchen as a dining room and building a new kitchen. These plans will prove

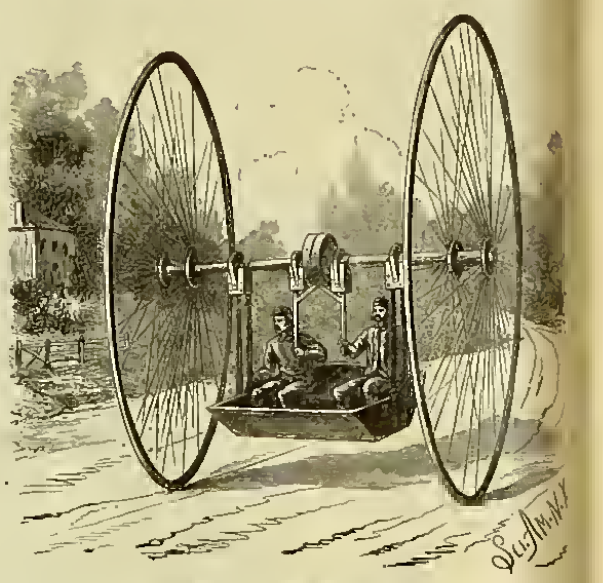


suggestive to those contemplating the building of a new house, even if radical changes are made in the accompanying designs.—*American Cultivator.*

SWING BICYCLE.

The bicycle shown in the accompanying engraving is the invention of Mr. Nathaniel Brown, of Emporia, Kans. The wheels are secured to the outer ends of two hollow axles or shafts, which are mounted upon a central shaft, and are formed with ratchet wheels and friction disks. The seat is suspended by means of arms connected to centrally slotted straps passing over the axles; the ratchet wheels pass through the slots in the straps, and are engaged by spring pawls secured to the forward upper ends of the arms. In connection with each of the two other ratchet wheels is arranged a block, held to the hollow shaft by straps, and provided with a spring pawl engaging with the teeth of the ratchet. Pivoted in recesses in the lower ends of the blocks are lever arms, formed with inwardly extending fingers, arranged so that when the arms are swung toward each other upon their pivots, the fingers will be brought to bear against the faces of the friction disks.

The pulling of the levers downward starts the main wheels forward, and at the same time swings the seat forward, thus moving the pawls carried by the arms supporting the seat backward, and bringing them into engagement with teeth upon their ratchets, not so far advanced as were the teeth with which they were primarily engaged. As the levers are moved forward, the swing of the seat toward its normal position will act to advance the bicycle, and by so reciprocating the levers it will be seen that a pendulum motion will be imparted to the seat, which will, when once started, propel the machine for some time. When desired to turn the machine, say to the left, extra force is exerted upon the right hand lever, which will cause to drive the right hand wheel forward faster than the other; or the motion of the left hand wheel may be checked by moving the left hand lever so that the finger will bear against the friction disk. To stop the machine, both brakes are applied by moving the levers toward each other. The rider may stop at any



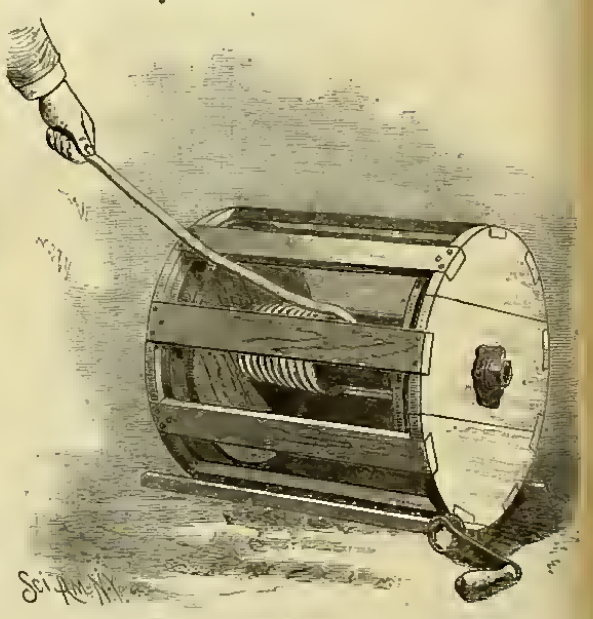
BROWN'S SWING BICYCLE.

desired point, when ascending a grade, and rest at ease, since any tendency of the machine to run backward would be counteracted by the weight of the seat.

IMPROVED LEAD PIPE REEL.

Lead pipe is usually put up on reels which do not have an inclosing case, the heads of the reels being connected by slots, which must be knocked off before the pipe can be unreeled and disposed to customers; and before the reel can be turned, it is necessary to elevate it upon a bar passed through its hollow shaft or body. Like trouble also attends the putting up of the pipe on the reel. These difficulties are obviated in the invention here illustrated, which has been patented by Mr. Fred. Eitapenc, of Oneonta, N. Y. The outer reel case is of circular form, and is made up of opposite heads connected by slats. Within the case is arranged the reel proper, which is provided with two heads, suitably connected together and mounted upon a shaft having bearings in the heads of the case.

One end of the shaft projects sufficiently far to receive a crank handle, by means of which the reel may be turned. By this construction there will be no ne-



EITAPENC'S IMPROVED LEAD PIPE REEL.

cessity of raising the reel from the ground either to coil the pipe upon it or to remove it, while the slats need not be removed, as the pipe can be passed between any two of them. The reel is thus rendered more durable by not having to knock off the slats to pay out the pipe, and the whole is so fitted that it may be readily taken apart when required.

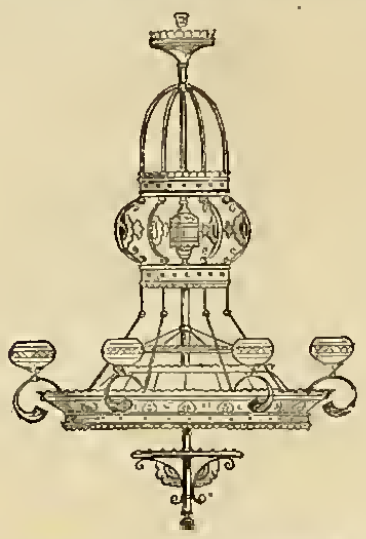
Lime Cartridges.

The cartridges have been found most valuable for work in many kinds of stone, including granite, Portland stone, sandstone, etc., as well as masonry of stone or brickwork. A block of granite weighing about four tons, and embedded on two sides and at the bottom in strong cement, was recently moved easily by two shots. In experiments for the Admiralty at Portland three shots of lime cartridges got thirty tons of stone in large merchantable pieces. The cartridges were used with great success for upward of twelve months in the formation of the Copenhagen Tunnel, North London, and they are now in use for removing the sandstone in the excavations of the Mersey Tunnel Railway Company, at Liverpool.

FRINK'S PATENT REFLECTOR.

The various reflectors manufactured hy I. P. Frink, of 561 Pearl St., New York City, under his patents are now used to a considerahle extent tbronghout the country. They are formed in various sbapes, patterns, and sizes for numberless purposes, from a highly polisbed silver plate which is corrugated on the surface. Tbe effect is to reflect the ligbt in a manner free from an objectionable glare, and to well diffuse it throughout a room.

One of the purposes for which the plate is found eminently useful is for application to the outside of a window which, owing to the construction of the building or from local causes, admits but little light. The refleetor is formed in an attractive frame, and being plaeed at a proper angle, reflects the daylight into a



FRINK'S PATENT REFLECTOR.

room. Tbe advantage in saving gas and preventing injury to the eyesight is very great, and it is astonishing how much light may be obtained by these means.

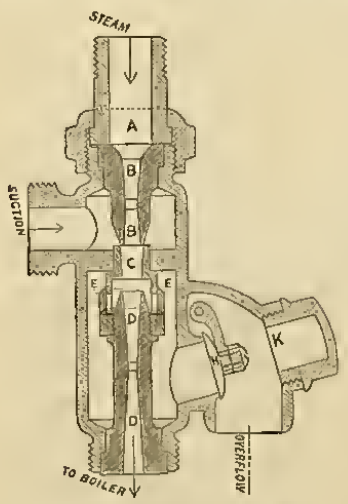
Then tbe reflectors have been made in an immense variety of kinds for different uses, sucb as for lamps, gas, oil, and electricity; in faet, from the smallest reflector, costing only a few cents, for a kerosene lamp, up to tbe magnificent chaudeliers used in the principal of our theaters, this reflector has been employed with excellent results. Tbe annexed engraving shows its application to a gas chandelier.

An illustrated catalogue giving full particulars of the material, prices, etc., will be forwarded on request.

PENBERTHY INJECTOR.

At last a mechanical combination and device has been produced, and a man's labor and study crowned with success, in the production, for tbe convenience of engineers, of a simple and compact device known as tbe Penberthy injector or boiler feeder.

Its mechanical construction is very simple, but perfect. All its parts are movable and convenient of access (not being screwed in), its working so complete that an inexperienced person can operate it with success and perfectness. Its adaptability to all classes of boilers, sucb as stationary, portable, traction, marine, and locomotive, and its working on eaeh, makes it very desirable, and recommends it to all classes of engineers. The automatie working of this injector is of very great advantage, as by this meehanical construction it works under all conditions of shakes, jars, and concussions. In



PENBERTHY INJECTOR.

case of a break, or the suction is to be removed and then returned. it picks up or begins working without any aid, assistance, or attention from the engineer, thereby relieving of mucb care and annoyance. Its convenience of access is of very great consideration and importance, owing to the advantage of eleaning and examining its interior parts.

The working parts of this injeetor are stationary in their work, thereby causing comparatively no wear in its meehanical parts. Tbe inventor seems to have combined common sense with mechanical science, by leaving out all complications, and combining in the injector every convenience of operating, gettiug at, and putting it on the boiler.

The body is of a single cylinder or barrel, witb two jets inside, "steam and combining," and governed hy an automatic swinging overflow. Tbe injector is operated by tbe opening or closing of the globe valves. It is connected to tbe boiler and pipes with uniform and interehangeable square eentered unions, and ean be put on or taken off very quiekly without any annoyance or injury, and the only tool required being an ordinary wrench.

Another great point gained in this injector is its great range of working capacity. It will lift water twenty-five feet perpendicular. or take it a hydraulic pressure and force it into the boiler at a temperature of from 140° to 180° Fah. It will work under a steam pressure of from 20 to 140 lb. It will also lift and force water at a very warm temperature (say 120° Fab.) in tank or well, and under all circumstances and at all points it works automatically. The inventor and manufacturers of the Penberthy injector have great confidenee in its working qualities, and to satisfy engineers of its merits and perfectness of work, solicit a trial. From observation, a brilliant future is in store for this little wonder of simplicity and compactness, which is a model of mechanism in appearance and finish.

For prices, etc., address Jenkins Bros., 71 John St., New York, 13 So. 4th St., Philadelphia, and 105 Milk St., Boston, agents for this injector.

DESIGN FOR A SUBURBAN COTTAGE.

This dwelling is designed for a locality where economy in width is desirable. Being in the main only sixteen feet wide, with a small wing on either side, the plan has been developed so that the accommodations are not sacrificed to tbe peculiar requirements of the situation. The staircase is so arranged as to he conveniently available from front and rear, and the parlor, dining room, and entrance hall can be thrown together for social occasions. The folding doors might be made to slide if preferred. The kitelien is sufficiently separated from the front portion of the house to exclude the odors from cooking, and is also properly loeated for efficient service in dining room and attendanee at front door.

Tbe kitchen is provided witb dresser, range, and sink, and tbe laundry has stationary tubs. A small sink is placed in pantry conneeting dining room and kitehen. From this pantry access is bad to tbe cellar, to which there is also an outside entrance. Batb room is in seeond story, and contains bath tub, wasb basin, and water closet. Hot and cold water througb house.

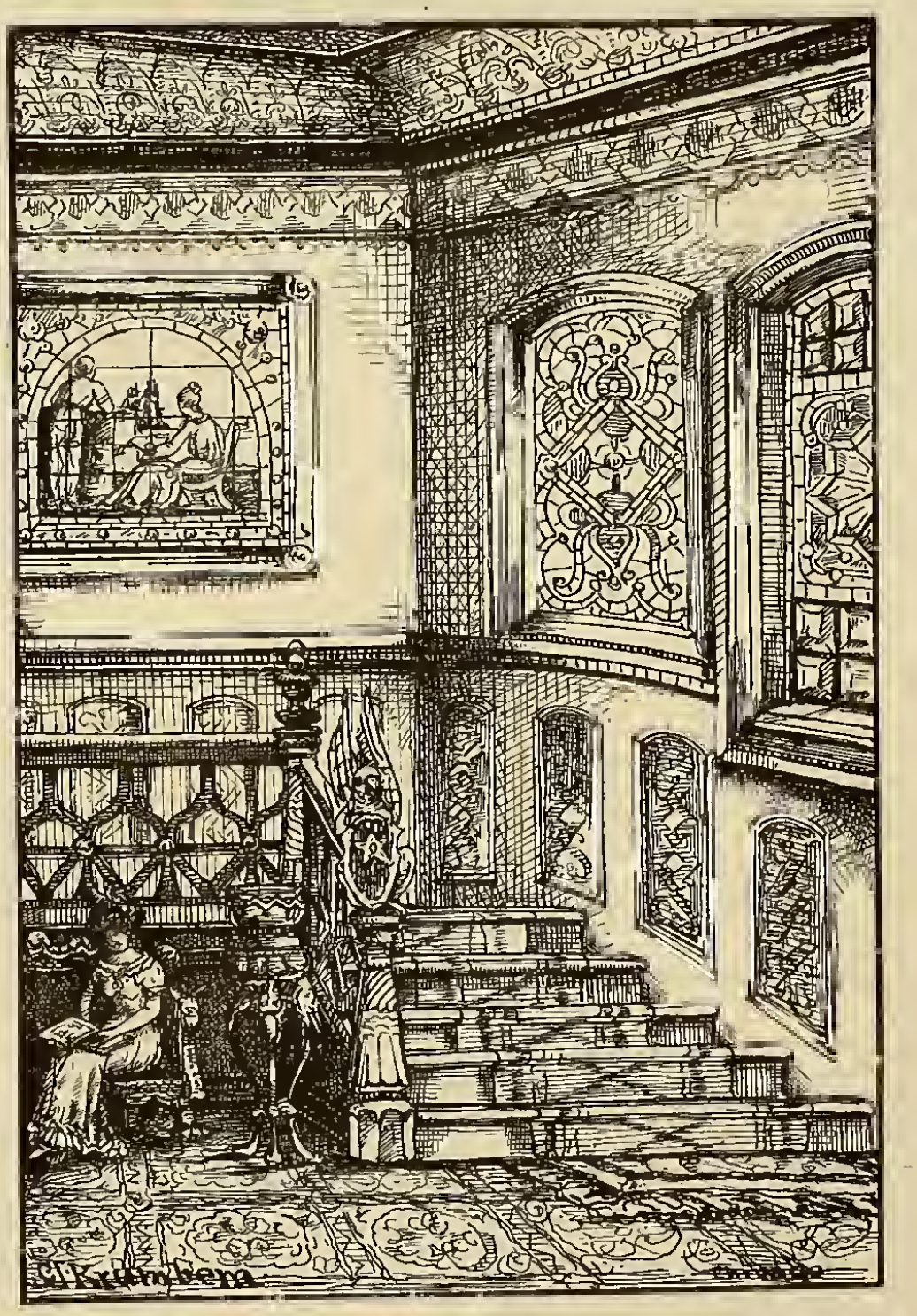
There are in all nine rooms, not including entrance hall and bath room, and the spacious attic ean be arranged with one or two good rooms if desired. Cellar extends under entire house. Exterior of house is sheathed, and covered with narrow elapboards, exeept front gable and a strip hetween first and seeond stories, which, with the roofs, are shingled. Cellar walls are of stone.

The estimated cost of this house is twenty-eight hundred dollars.

The arebitect is Charles G. Joues, 280 Broadway, New York.

DECORATIONS FOR A HALL.

We give a design for decorations for a hall and stairway, of moderate cost, for a country dwelling. Part of the glass of the windows is painted and part treated with beveled plate. The wbole effect is rich and pleasing. Designed by C. J. Krumbeine, Argyle Park, Ill.



HALL DECORATIONS FOR A COUNTRY DWELLINO.—DESIONED BY C. J. KRUMBEINE, ARGYLE PARK, ILL.

DWELLINO AT DETROIT, MICH.

The perspective drawing and plan annexed represent a brick and frame house lately completed on Farnsworth Street, Detroit, Mich., from the designs and under the superintendence of Mr. A. C. Varney, arehitect, of 50 Campau Building, Detroit.

The house, which is of an attraetive description, was built in a substantial manner, of good materials, at a cost of $2,600.

A SAFETY attachment for elevator cars bas been patented by Mr. Charles R. Whittier, of Yonkers, N. Y. It is to prevent tbe elevator car from falling in case the hoisting rope should break, and consists of a speeial arrangement of wedges and counterweigbt rope, in connection with the boisting ropes.

A FRAME SCHOOLHOUSE OF MODERATE COST.

SPECIFICATION

of the materials and labor required in the erection of a new frame schoolhouse in district No. 7, Cranston, R. I. Wm. R. Walker & Son, architects, 27 Custom House Street, Providence, R. I.

MASON'S WORK.

Excavations.—Excavate for the cellar 5½ feet below the finished grade around the building, leaving all the earth excavated and not required for back filling against cellar walls in the low part of lot near the two rear corners.

Cellar Walls.—Build cellar walls about 5 feet high by 1 foot 6 inches thick, from good building stone laid up dry; wall on a straight, true, plumb line, and level off same for starting the underpinning.

Cellar Steps.—Furnish materials and build cellar steps from 3 inch x 12 inch North River bluestone set in brick laid in sand and cement mortar, and the sides of cellar entrance faced up in stonework laid in cement and sand mortar.

Window Sills.—Furnish pointed granite sills to all cellar window openings.

Curbing—Amend opening for cellar steps, and under the porches and steps furnish and lay down 3 inch x 12 inch North River bluestone flagging set in cement and sand mortar. The flagging under porches and steps to set on stone foundations two feet above grade.

Underpinning and Piers.—Furnish good hard body brick and build underpinning walls about 3 feet high by 8 inches thick, the brick on face of underpinning to be selected of even color and laid up in lime and sand mortar colored red. The remainder of brickwork to be laid in lime and sand mortar.

Chimney.—Furnish good building bricks and build the chimney of the size and in form as shown and figured on drawings. The walls to be laid up 8 inches thick in lime and sand mortar, with 16 inch x 30 inch cast iron door frame and door in the base of the chimney and openings cut through the walls for inlet of ventilating pipes when and where required. Top the chimney out through roofs with selected body brick laid in red colored mortar, with a 6 inch x 8 inch split faced bluestone belt at starting of openings in face; the belt to have good beds and 1 inch drove margin lines on outside corners. Inside of chimney finish and set up one 10 inch cast iron smoke pipe 40 feet high with ⅜ inch shell, to have flanged and bolted joints and ten inch inlet under first floor joist; the inlet pipe to bolt on the main upright pipe and to extend out to and through the brick wall of chimney.

Pointing.—Point up the stone walls inside of cellar with lime, sand, and cement mortar, and whitewash all stone and brick work inside of the cellar.

Grading.—When underpinning is laid up, grade up around same to a line 2 feet 8 inches below the top, so as to incline the earth away from the cellar walls.

Lathing.—Lath the walls and ceilings of all the rooms, halls, wardrobes, and sides of stainings to basement and loft with best quality four foot spruce laths with four nailings to each, the side joints to be laid ¼ inch open and the end joints broken at every 3 laths. The lathing in schoolroom to stop at a level line 2⅓ feet from the top of finished floors, and in all other rooms, wardrobes, and halls to a line four feet above the floor.

Plastering.—Plaster all the walls and ceilings above specified for lathing, one good coat of brown plastering mortar made from slaked, screened, and puttied lime, laid one week to cool, clean sharp grit mortar sand, long well beaten cattle hair, and clean water used in the proper proportions for mixing good strong plastering mortar, to be well rubbed into the joints between laths, forming good strong clinches back of same, to be put on of even thickness, straight and true at all angles, and when at the proper stage of drying to be thoroughly troweled to a hard smooth surface. Any broken places in the mortar, after woodwork is put up, to be repaired in a smooth and workmanlike manner.

Finally—The mason to remove all rubbish from the inside of building and cellar, to sweep out the interior of building when plastering is done, to do all work in a good and workmanlike manner, when the same is required, and without delay or hinderance to the contractor for the carpenter's work, and to furnish three pounds to the square foot sheet lead flashings, and build the same into walls of chimney where the same comes out through the roof.

CARPENTER'S WORK.

Framing.—Frame the building with good sound straight-sawed spruce timber of the following dimensions: Sills, 3 in. × 6 in.; first floor joists, 2 in. × 10 in., 16 in. from centers; posts, 4 in. × 6 in.; window and door studs, 3 in. × 4 in.; intermediate studs, 2 in. × 4 in., 16 in. from centers; plates 4 in. × 5 in; ceiling joists, 2 in. × 8 in., 24 in. from centers; tiner posts, 6 in. × 6 in; lower plates, 6 in. × 6 in.; braces, 4 in. × 6 in; studding around the circle, 2 in. × 6 in.; plates and girts made of two thicknesses of 2 in. spruce planks sawed on the circle. The rafters in roofs to be 2 in. × 7 in., 20 in. on centers, with 2 in. × 6 in. in cellar joists; over the center of each schoolroom to be framed a truss with 6 in. × 10 in. tie beam, with 6 in. × 8 in. straining beam and rafters, and 1⅛ in. iron rods with nuts and washers.

Boarding.—Board the walls and roofs with 1 in. hemlock boards, surface planed to ⅞ in. thick, and well nailed to the framework.

Under Floors.—Furnish and lay down ⅞ in. hemlock under floors to first floor, and a strip 3 ft. wide down through center of loft.

Shingles.—Shingle to roofs with best quality shaved cedar shingles laid not over 5 in to the weather, and well nailed to the roof boarding. Shingle the walls from the top of window belt to the under side of cornice with best quality sawed cedar shingles, laid in straight courses not over 5 in. to the weather, and well nailed on.

Clapboards.—Cover all walls between the bottom board and window belt, including the nailing of porches, with 4 ft. eastern-sawed sap clear white pine clapboards, planed and painted, laid not over 4 in. to the weather, and well nailed, with all nail heads set in and united at all corners.

Paper.—Under clapboards, shingles, and trimmings on walls of building lay one thickness of "Bird's" waterproof sheathing paper, lapped not less than 2 in. at all joints.

Trimmings.—Get out, make, and set up from clear dry seasoned white pine, all the window and door frames, cornices, bottom boards, belts, and porches. To be made as per detail drawings furnished. The walls and ceilings of entrance porches to be covered with dry seasoned matched ⅞ in. white pine, with a ⅞ in. angle bead in corners of the arches. The floors of porches to be made from 1⅛ in. by 4 in. clear dry Southern hard pine jointed on the edges and laid ⅛ in. open joints, the sill and floor joist of porches first being covered with two thicknesses of tarred sheathing paper laid on top of the joists. The steps 1⅜ in. and risers ⅞ in., to be made from clear dry Southern hard pine, laid on stout 3 in. chestnut stringers sawed to receive treads and risers. The railings at ends of steps to be made from dry whitewood or pine, with turned tops on the posts and turned or straight moulded balusters. The thresholds of the doors at entrances to be made of clear dry seasoned 2 in. ash. In the cornices of the porches are entrance steps. Lay in a good sized gutter, line it with best I. C. tin, M. F. brand, well laid and rosin soldered, and run 3 in. galvanized iron leaders from the gutters to the ground, and turn bottom ends out with galvanized iron shoe at bottom.

Belfry.—The deck of belfry to be made by laying down 2 in. matched dry spruce on 4 in. x 12 in. floor boards, and to be a scuttle 2 ft. x 3 ft. through the deck with a step ladder leading to same from under the roof of building. The bell deck to be covered with I. C. roofing tin, M. F. brand, well laid and rosin soldered, and to turn up on sides of belfry 12 in., with the joints wiped with solder. The scuttle in deck to be covered with tin same as deck, hung to former with stout strap hinges, and fasten with stout iron hook and staples from inside. The walls inside of belfry to shingle same as walls of tower, the soffits of arches to be ⅞ in. matched white pine, with bead on outer corners to receive shingles, and the ceiling of belfry below plate to be ⅞ in. matched and beaded pine, fastened to 2 in. x 6 in. ceiling joists laid 2 ft. from centers. The finial and vane at apex of tower roof to be made from 20 ounce cold rolled copper, with the balls, vane, and flutes in skirt covered with gold leaf.

Cellar Windows.—The cellar window and door frames to be made as shown on plans, and set in walls whenever the masons are ready therefor.

Sashes.—The window sashes to be made from clear dry seasoned and kiln dried 1½ in. white pine, and of the forms and sizes shown on plans and elevations. To be glazed with second quality French sheet glass, and all windows on first floor hung to the frames with braided cotton sash lines passing over 2 in. polished wheel axle pulleys and counterbalanced with cast iron weights in pockets of the frames, weights in mullions of the main frames to have 2 in. pulley in the top ends of same. The sashes in gable end windows to be fitted and screwed in. The cellar window sash to be hung to frame with strap wrought hinges, and fastened at top with stout iron bolts.

Furring.—Cross furr the ceiling of all first story with ⅞ in. x 2 in. spruce strips, 16 in. from centers, and put up straight and true and well nailed. Furnish and put up ⅞ in. x 2 in. grounds at top line of the ceiling on sides of rooms, around windows and door openings, the grounds to be straight, true, and out of wind.

Door Frames.—Make door frames from 2 in. dry, seasoned plank (white pine), rebated to receive the doors, and when plastering is dry, set the same in door openings of partitions, straight, square, true, and plumb, and securely fastened in their partitions. All door frames from halls to schoolrooms to have 20 in. top light over the doors.

Partitions.—Partition the interior into rooms, as shown on the floor plans, with 2 in. x 5 in. straight sawed and sized spruce studding, set 16 in. from centers, with row of straight 2 in. x 5 in. bridging at top line of ceiling on walls, and one row of 2 in. x 4 in. bridging at the top line of blackboards. The studs to be doubled and trussed at side and top of all openings for doors, and to be segment arched turned above sinks in the halls.

Stairs.—Build stairs to attic and basement with 1⅛ in. treads and ⅞ in. risers of dry spruce, and fastened to 2 in. x 10 in. sawed spruce stringers, and the front edges of treads to be a half round. The partitions around basement or cellar stairs to be 2 in. x 3 in. studs.

Finish.—Finish good, dry seasoned, and kiln dried white pine mouldings, 5½ in. x ⅞ in., and case all window and door openings on first floor of schoolhouse. Furnish material and ceil up the walls of schoolrooms 2½ ft. high with ⅞ in. x 4 in. matched and beaded whitewood or pine strips, set perpendicularly, with chalk shelf, and moulding at top edge of ceiling and 3½ ft. above chalk shelf. Finish and put up a ⅞ in. x 5 in. surface moulding, thus forming top of blackboards. Ceil the walls of all other rooms, wardrobes, and halls with the same ceiling boards as above mentioned, 4 ft. high, with a ⅞ in. x 5 in. surbase moulding at top of the ceiling.

Doors.—The doors to be of clear, dry seasoned, and kiln dried white pine, 1¾ in. thick from panels to each door, with moulded faces and wide moulded middle rails. To be a 1¾ in. pine sash top light over each door from schoolroom to hall, and glazed with one light French sheet glass, and hung to frame at bottom rail of sash, with stout "Stanley" wrought iron butts, and operated with one "Molensack" transom lift to each top light. The doors to be hung to frames with three 5 in. x 5 in. loose joint cast butts, and trimmed with lock and knobs, cost $2.50 for each door, and selected by the architect. To be rubber head stop knobs, set in ceiling behind where each door swings, to prevent door knobs from striking.

Platforms.—Furnish good, dry-seasoned ⅞ in. planed and matched clear Southern hard pine, and build platforms for teachers 10 in. high and of the size shown.

Floors.—Furnish good, dry-seasoned and kiln dried ⅞ in. planed and matched clear Southern hard pine flooring of the best quality, no boards over 4 in. wide, and lay down the top floors of schoolhouse to have two thicknesses of best deafening felt between under and upper floors, to be laid to close joints, blind nailed and smoothed.

Thresholds.—To be ⅞ in. or ¾ in. dry, clear Southern hard pine thresholds under all inside doors.

Wardrobes.—Put one shelf around each wardrobe 12 in. wide and at the line of top of ceiling or surbase moulding. Under the shelf and top of the ceiling boards furnish and screw on stout japanned double wardrobe hooks, 36 in each wardrobe.

Closets.—In each teacher's closet put down 7 in. base board with 2½ in. x ⅞ in. moulding top of same, one 12 in. shelf across back of each closet, a 3 in. strip around sides of each closet, with 12 stout japanned double hooks screwed to strips in each closet.

Sinks.—Furnish, set, and case up two cast iron sinks, four feet long, with the inside of sink enameled, to waste through 2 in. tar coated cast iron pipe with lead calked joints, to outside of cellar walls.

Books.—The space under arch at side of closet in each teacher's room to have a pine case with movable shelves built into the recess and with a light moulding around top of shelving.

Ventilation.—Furnish good, sound, dry box boards and build 8 in. x 16 in. wide ventilating ducts from the floors of each schoolroom to attic, and thence into the brick ventilating duct, each flue entering the brick chimney independently. At the base of each flue in schoolrooms furnish and set in one 16 in. x 20 in. enameled cast iron ventilating register, secured to the ceiling of room.

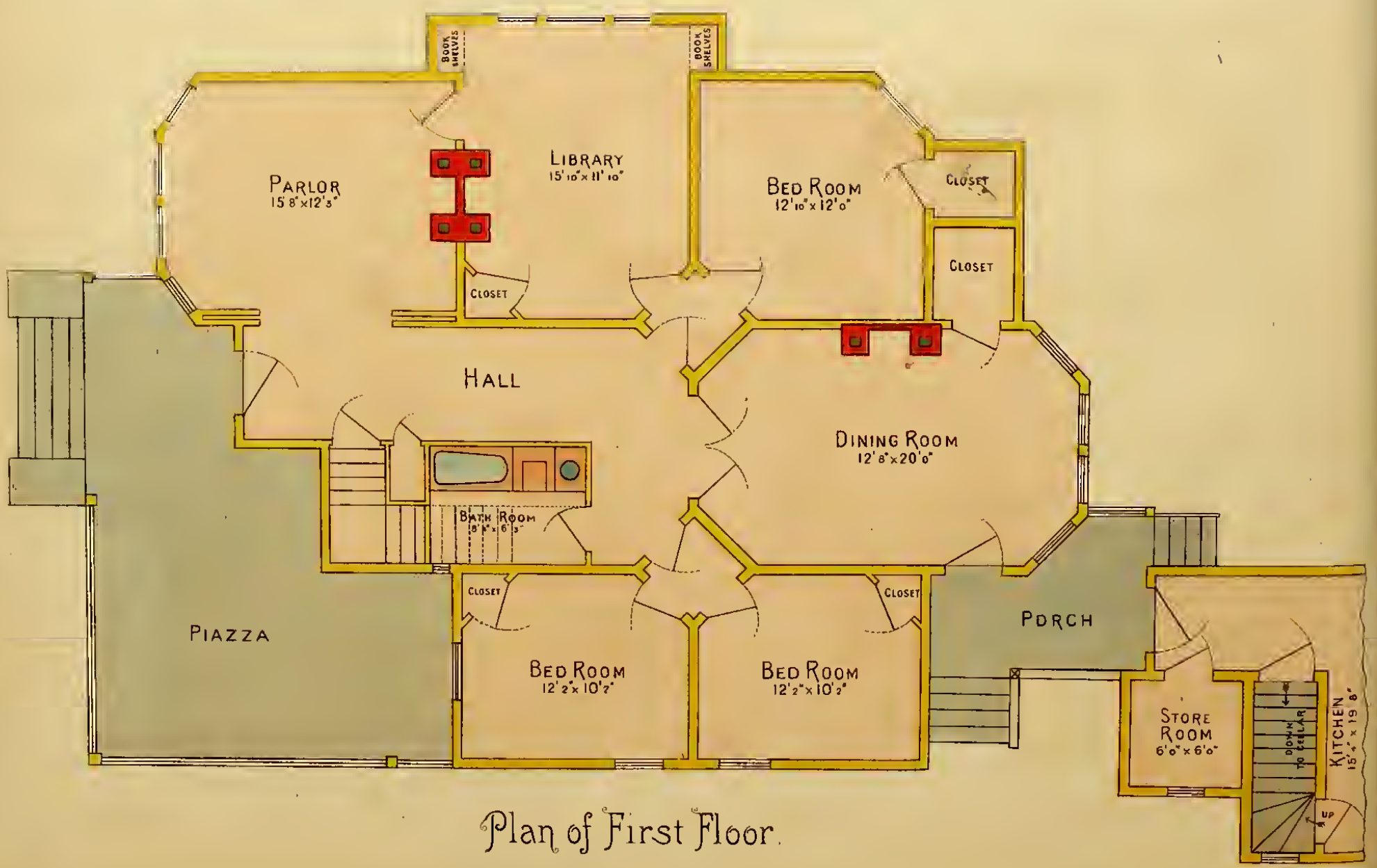
Cutting.—The carpenter to furnish men to do any cutting that may be required for the heating pipes, and to cut in all the registers in floor which are furnished him by the contractor for furnaces.

Top Lights over Windows.—The two top lights over single windows in each schoolroom to be hung to transom, and operated with Molensack fixtures, the same as specified herein for the top lights over doors.

Painting.—Paint all the exterior woodwork, other than roofs, two good coats of linseed oil paint, mixed to the colors as architects shall designate, and in two or more colors. The priming, or first coat, to be a good, heavy coat of paint, put on as fast as the woodwork is put up. The nail heads and cracks to be putty stopped between first and second coats of paint. All pulley stiles of windows stained with a red oil stain, and all tinwork painted two coats "Prince's" metallic paint. Paint all interior woodwork, other than floors and stairs, three coats of white lead, oil, and turpentine, colored as architects desire, and in two tints. Putty stop all nail heads and cracks, and draw all window sashes and top lights two coats Indian red. Oil all the Southern hard wood pine, floors, and platforms one coat best linseed oil, with umber stain in same.

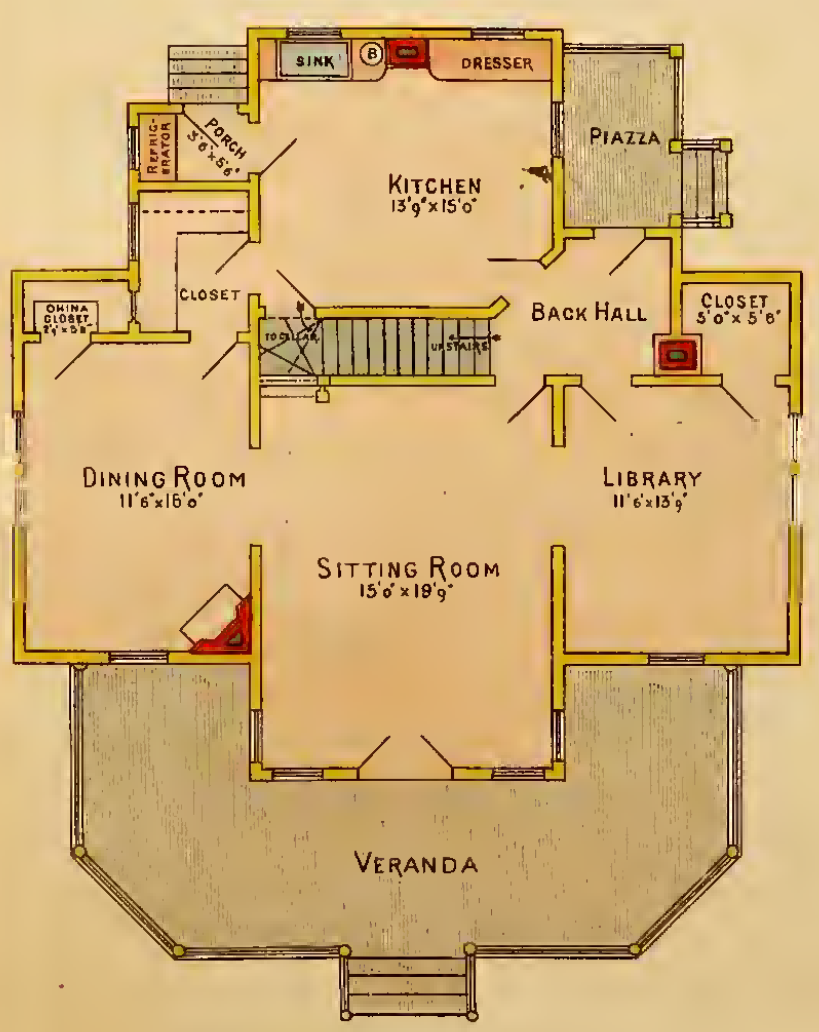
Finally.—All work to be done in a good and workmanlike manner, under the superintendence of the architects, and in strict conformity with the drawings furnished and these specifications.

A One Story Dwelling With Detached Kitchen. CHRISTOPHER MEYERS, ARCHITECT.

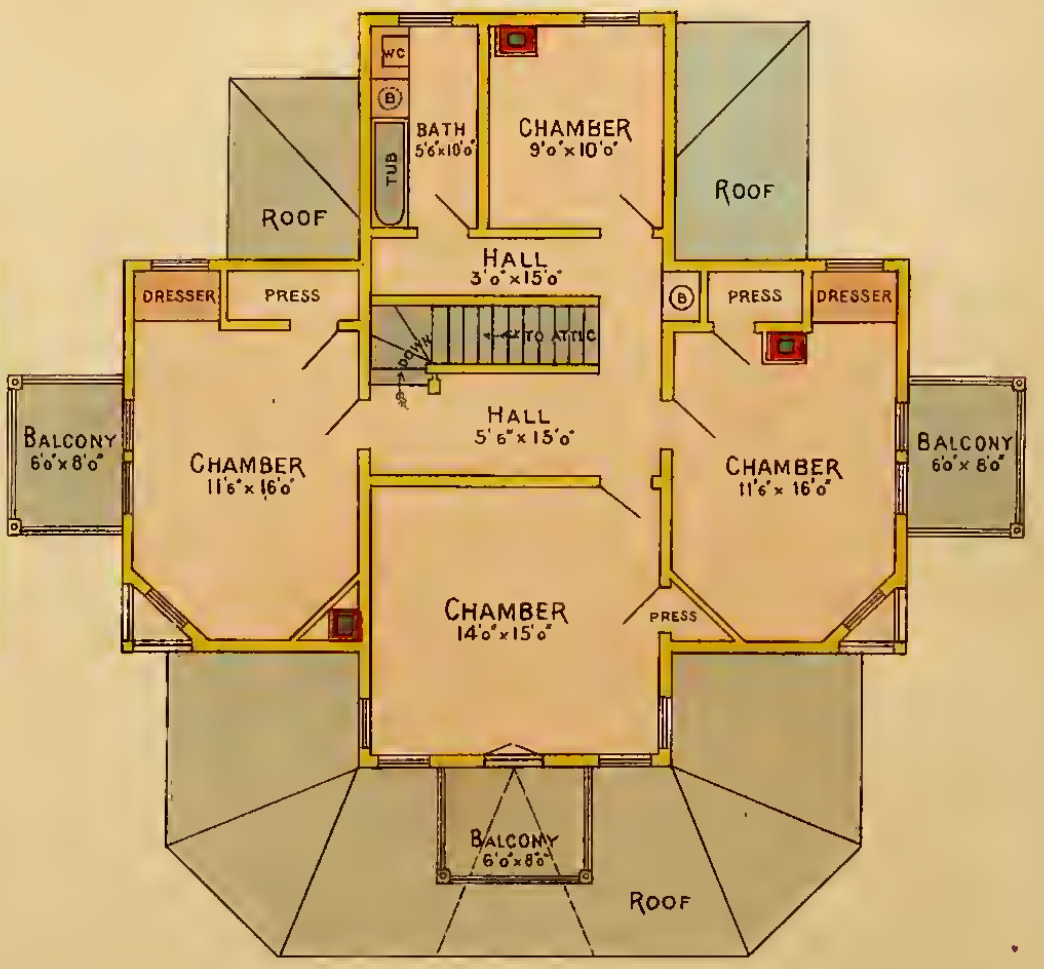


Plan of First Floor.

A Two Thousand Six Hundred Dollar Cottage. GEORGE W. CADY, ARCHITECT.

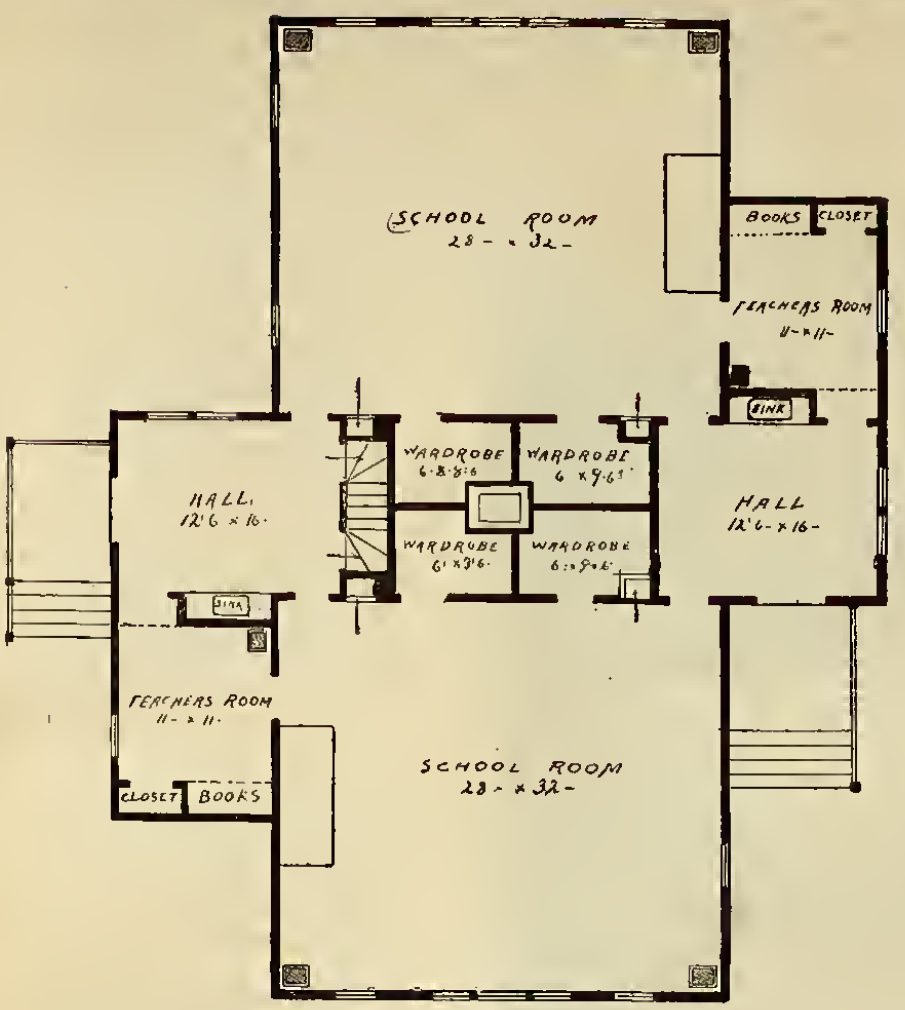


Plan of First Floor.

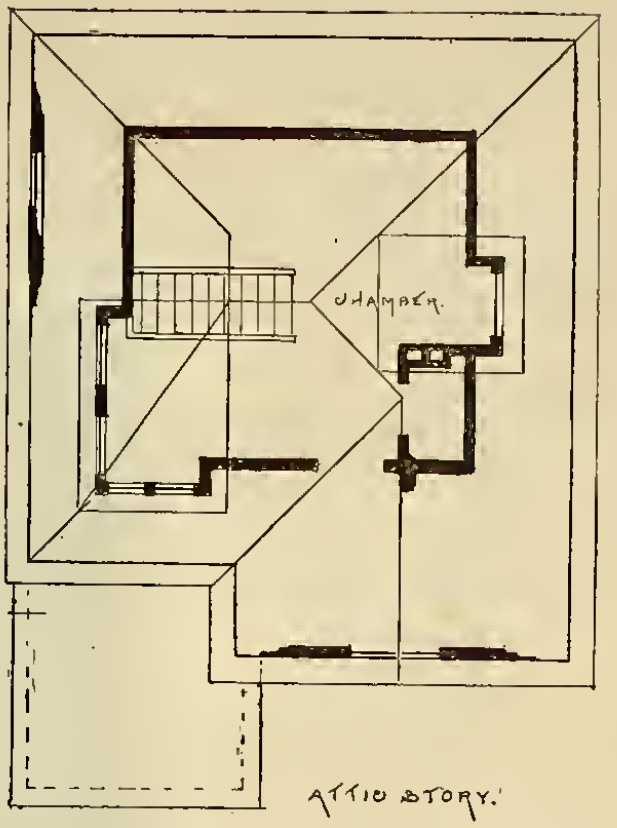


Plan of Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK.



FLOOR PLAN.



ATTIC STORY.

A FRAME SCHOOLHOUSE OF MODERATE COST.

THE PAMPAS GRASS.

A stately mass of pampas grass in full plume is always a beautiful sight in a garden, and particularly if so placed that the surroundings heighten its effect. In such a position is the noble specimen in Mr. Gatehouse's garden at Chichester, who kiudly sent us a photograph of it, taken last season by Mr. Malhy. It was then exceptionally fine, the great mass of plumes being nearly ten feet high. It is planted in a part of tbe garden snugly surrounded hy trees. Close to it is a stone-edged water basin and fountain, so that this corner is a pretty feature of the garden. The ring of flowering plants around the base of this pampas is decidedly a mistake. Sucb a stately plant as the pampas needs no embellishing, and it never looks better than when seen rising from a lawn with room to spread out its grass in a graceful way. The soil about the plant can be now and then enriched in the same way as when a circular bed is made around it. Mr. Gatehouse's pampas is of the best variety, the one that produces large spreading white plumes. There is such a great difference between the good and tbe bad varieties of the pampas, tbat care sbould be taken to get tbe best form, seeing that the plant always forms an important permanent feature of a garden, if it succeeds, and one that takes a long time to develop, and which is so difficult to replace.—*The Garden.*

PAMPAS GRASS.

[The Garden.]

A NEW ORLEANS GARDEN.

Abont gardening in New Orleans, and about our own garden in particular, I am sorry to say there is not much to record. Ground being very cheap here, all the best residences, the majority of which are wooden, are built upon large "lots," measuring each from 80 ft. to 125 ft. in front by 160 ft. to 250 ft. in deptb, and in some cases mucb more. This arrangement allows free ventilation and sunlight, and sufficient space for town gardening where people choose to take advantage of it. There have been but few atteupts, however, at artistic effect; on the contrary, the grounds are planted in tbe most desultory manner, the main effect heing apparently to get as much into them as possible. Notwithstanding, the general effect of these "wild gardens" is decidedly pleasing, and, in consequence, New Orleans has a widespread reputation for beauty, in addition to the quaint picturesqueness of the French quarter, about wbich so much has been said. As our winters are generally short and mild, and the atmosphere quite moist, vegetation is strong and rapid in its progress, so that in two or three years new dwelling houses, which are never more than two stories higb, hecoue embedded in dense verdant thickets, whicb, but for the saw and shears, would soon crowd those structures not only out of sight, hut occasion speedy ruin and decay.

Our shade trees are for the most part natives, such as oak (several species), cypress, elm, catalpa, sweet gum (liquidambar)—probably the most beautiful of all—plane, hackberry, magnolia grandiflora, pine, cottonwood, etc.; to which may be added, of foreign introduction, tallow tree (stillingia sebifera), privet (ligustrum japonicum), pride of India, or China (melia azedarach), Japan varnish (sterculia platanifolia), and ailantus. For ornament the orange tree is in general use, especially tbe hitter species, which is not only somewhat hardier than the edible orange, hut holds undisturhed possession of its heautiful fruit from one season to another. In addition to oranges we have palms, of which there are three indigenous speeics, and about as many more from abroad which are equally hardy; also pittosporums, magnolia fuscata, oleander (pink, crimson, purple, lilac, and white flowered), sweet olive, smoke tree, laurustinus, Cbinese azalea, bottle hrush, castor oil, camellia, crape myrtle (lagerstrœmia—crimson, rose, lilac, and white flowered), the prince of all flowering trees; cape jessamine (gardenia florida), pomegranate, yucca, cycas revoluta, banana, hamboo, poinsettia, agave, acalypha, alocasia, and others too numerous to mention.

In regard to my own garden, after several years of unsatisfactory work, I laid it out upon what is sometimes called the French system, *i. e.*, in circles and in portions of circles, and it has proved to he quite a success. It has no walks, tbe result heing a long, unbroken sward,* which, hesides its intrinsic beauty, deepens the perspective, and adds very greatly to the effectiveness of the water, rockery, and tree plantation in the rear.

For flowering plants, we rely mainly upon roses, more especially teas, all of whicb flourish in the open air witbout protection, and the display of color which they produce in March, April, and May is truly magnificent. Even now and until Christmas an abundance of blooms may he cut for house and table decoration. Besides roses, cannas—of which ehemanni is by far the hest—crinums, hydrangeas, Chinese hihiscus, lantanas, abutilons, plumbagos, chrysantbemums, and a host of others with which readers of the *Garden* are familiar adorn the borders. For bedding purposes we rely principally upon pansies, anemones, phloxes, gladioli, and hyacinths for early spring; portulacas, pelargoniums, petunias, torenias, salvias, asters, balsams, and coleuses for summer; and chrysantbemums, dahlias, zinnias, etc., for autumn and early winter. At present (November 20) the garden is all ablaze with roses, zinnias, alternantheras, acalypbas, poinsettias, chrysanthemums, acacia corymbosa, perennial ipomæas, antigonums, annual thunbergias, manettias, etc. For covering trellises and verandas, we make anotber large draught upon roses, such as Marechal Niel, Solfaterre, Lamarque, Queen Henrietta, Gloire de Dijon, Ophirie, and Perle des Jardins; but, in addition to these, much use is made of rhynchospermum jasminoides, solanum jasminoides, wistarias, bignonias, clematises, antigonums, boneysuckles, ipomæas, and aristolocbia elegans. The seed of the aristolochia was received hy Mrs. Richardson some years ago witbout any name, and has been extensively cultivated ever since. It requires but little protection in winter, and when killed to the ground shoots up again early in spring.

In our pond, which is cemented, we grow several species of nymphæa, of which devoniensis and rubra are probably the most satisfactory; also nelumbiums (speciosum and luteum), pontederia crassipes, limnocharis humboldti, pistia, and trapa. The last, in consequence of its very rapid development, has to he cleared out every few weeks. Last season we succeeded in flowering the Victoria regia without artificial beat, the young plant having been started in the propagating bouse, and transplanted early in June.

For some years past I have been endeavoring to acclimate some of the subtropical palms which grow at considerable altitudes in their native countries, and thought that I had succeeded in adding quite a number to our old list until last winter, when tbe extreme cold wbicb we experienced wrecked all my bopes. Only one genus (sabal) is indigenous to this locality, and of this we have two species, adansoni and serrulata. To this may be added s. palmetta and pritchardia filifera, which helong to the same latitude, the former in Carolina and the latter in California. Two species of chamærops, excelsa and fortunei, and phœnix dactylifera were naturalized long ago, and of late years cocos australis has also been found to he quite hardy. To these I had added phœnix tenuis, sylvestris, reclinata, canariensis, spinosa, and rupicola, sabal blackburniana, jubea spectabilis, corypha australis, latania horbonica, kentia belmoreana, and rhapis flabelliformis, and by means of such protection as was afforded by stuffing Spanish moss (tillandsia usneoides), which hangs in such profusion from our forest trees, between the petioles so as to envelop the crown, all went well for some time. Phœnix reclinata and canariensis and latania borbonica had already attained considerable size, the former furnished with a trunk 5 ft. high hy 2½ ft in diameter, and the latter with one 3 ft. by 12 in.—the admiration of every passer hy. Many of our neighbors, profiting, as they supposed, hy our successful experiment, made similar plantations upon a smaller scale, and, therefore, the part of New Orleans in which we reside had begun to assume quite a tropical appearance. But, alas! for all our joys and hopes, on the 8th of January, 1886, there came from the far-off Rockies in the Northwest a "blizzard," which carried death and destruction not only to all delicate and half-

* Our best lawns consist of Bermuda grass (cynodon dactylon ?), which forms a beautiful turf, but, unfortunately, loses its leaves by the first frost. Has its seed ever been discovered ?

VIEW IN DR. RICHARDSON'S GARDEN, NEW ORLEANS.—[From a Photograph.]

hardy vegetation, but also destroyed many of our indigenous trees and shrubs, and even extended its ravages into countries ten or twelve degrees south of us, destroying some large plantations of coffee trees on the east coast of Guatemala.

The thermometer registered 12° Fahr., and the ground remained frozen for a week—a circumstance which had not happened along this coast before for more than sixty years. It was not until the weather became warm that we began to realize our losses, and, in some cases, not until the following spring. Suffice it to say, there now survive one phœnix canariensis, two large sabal palmetta, two chamærops, one cocos australis, one jubea spectabilis, and several small sabal adansoni and serrulata. Although greatly discouraged, yet, hoping that we may not live to experience such another visitation of northern weather, we have inaugurated another similar experiment. I ought to say, in praise of the sabals chamærops, cocos, and jubea, that they stood the severe trial without any protection whatever.

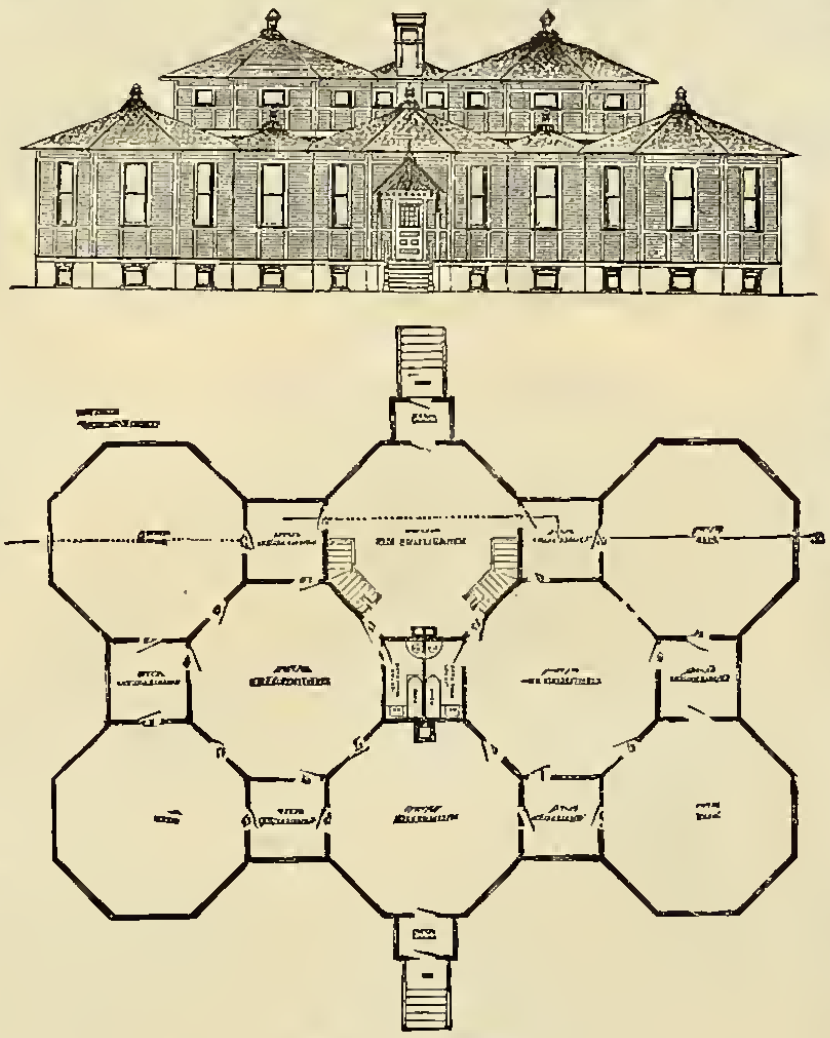
The length which my remarks have already run forbids even the enumeration of other plants which succumbed to this terrible frost. The death of four-fifths of all the orange trees in this neighborhood was, of course, the greatest loss, both on account of their economic and decorative value.

T. G. RICHARDSON, M.D.

A MUNICIPAL HOSPITAL.

The city of Detroit, Michigan, after a struggle and conflict of many years' duration, has at length got an excellent hospital completed. It was designed by Health Officer Dr. O. W. Wight. He had certain ends in view, and planned an edifice in order to secure them practically. The architecture was made to conform to certain ideas of sanitary use. No closets for the heedless storage of infected clothing and bedding; no hollows in the walls or under floors for the burrowing of hospital germs; no attic places for the accumulation of contagium in the infected air; regulated warmth, dry and non-absorbent material, plenty of softened light and good ventilation—such were the needs of a contagious disease hospital, and the problem was to secure them by a structure at once economic and convenient for use.

Brick and stone were rejected as material, involving as they do either dampness or hollow walls. A frame would also necessitate "dead spaces" behind the plastering and above the ceiling. The method of building a grain elevator suggested the idea of the construction. Thus solid wooden walls could be made, which, when properly painted, would be non-absorbent, not subject to change of temperature, and dry. In order to avoid needless weight of material, awkwardness of form, unsightly partitions, and sharp angles; in order to secure the greatest amount of light, sunshine, utilization of the entire inclosed space, and convenience of administration; in order to obtain accommodation for the greatest number of patients at the least expenditure; in order to obtain wards of moderate size and proper rooms for needful isolation of the moribund or delirious; in order to arrange for speedy disinfection and cleanliness, the plan was adopted of a series of octagons separated by square rooms, all contiguous, yet separated by solid walls of painted wood, although communicating with doors wide enough to admit of the easy passage of the regulation hospital beds.



A MUNICIPAL HOSPITAL.

A glance at the illustrations will show the arrangement of the larger octagon and smaller square rooms. There are six external octagon rooms, twenty-four feet in diameter. There are also six external square rooms, ten feet across. All these inclose two octagon rooms, with an intervening square room, of the same size.

The basement, half under ground, half above, is made of hard burned brick, laid in good cement, and well cemented on the outside of the wall. It is paved with hydraulic concrete, and is nine feet high to the lower edge of the floor joists, which are mill dressed. There are double glazed windows all around, opening and shutting with transom rods. The basement rooms all open into one another. Thus is secured clean, well ventilated space for boiler room, kitchen, laundry, pantries, drying rooms, water closet and bath room, etc., etc. Doors from without lead to the basement on both sides of the building. The planed under surface of the floor above constitutes the ceiling of the basement. The walls are finished in hard calcimine. All the domestic arrangements of the hospital are thus amply provided for without encroaching upon the floor of the building devoted to patients.

Above the foundations the walls are built up with seasoned two by four pine stuff, laid flatwise and fastened together with long nails. The stuff is dressed to gauge, and the inside of the wall is planed smooth before painting. The outside is boarded up and down, so that the walls are solid, and five inches thick when finished. The height of the walls is fourteen feet from the floors. The windows are four feet from the floor, double glazed, divided into three parts, the middle stationary, the lower sliding up, the upper opening with transom rods. The doors are extra wide, to admit of rolling beds from one room to another. The floors are double, the lower course of pine, the upper of white maple. The two central octagons and the intervening square are carried up six feet higher, with windows all around above the adjacent roofs, opening and closing with long transom rods, for ventilation and light.

The roof all over is broken up into separate cones, with one-fourth pitch, over each room, with intervening gutters. The roof is of solid wood, two and one-half inches thick, covered with tin. The under side of the cone-shaped sections of the roof over the separate rooms is the ceiling of the rooms. There is no upper floor, consequently no attic spaces at all. The thickness of the timber roof is to prevent heating through in summer and chilling through in winter. The hospital part of the building is one story, and all rooms for the sick are open from the double floor to the thick solid roof. At the center of each conic section of the roof, consequently at the apex of each room, is a solid ventilating shaft, octagon or square in form, according to the shape of the room, extending four feet above the roof, hooded to prevent the entrance of rain and snow, the opening of which is regulated from the inside.

The central rooms are also ventilated below by shafts from the outside. The two bath rooms and water closets into which the central square is divided are ventilated with elaborate care.

The whole building is heated with low pressure steam. Some of the more exposed rooms have three radiators. All radiators are placed under windows, and air is introduced to them by apertures through the wall behind them, regulated by slides.

The hospital is supplied with water from the city water works, and the sewers and drains are constructed in the most careful manner. The whole building is lighted with gas.

There is no plastering in the building. Each room, lined with painted and varnished wood, can be washed out with a hose, like a tub. There is no hollow space in the whole structure big enough for a mouse to creep into. The walls are non-absorbent, and the whole hospital can be kept clean and sweet with a minimum of care and toil. The building, containing no blind spaces, is practically fire-proof. Fire cannot be concealed in solid wood, and will not kindle and spread where there can be no draught. Besides, a hydrant at the door, ready to attach hose, will furnish complete safety.

The whole cost of the building, including plumbing, heating apparatus, and especial provisions for lighting, is not quite eleven thousand dollars, and will accommodate fifty patients without crowding. It stands in the middle of ten acres of ground, is within two and one-half miles of the center of Detroit's population, and yet is quite in the country. The county of Wayne furnishes the ground and unites with the city in the maintenance of the hospital. Thus the surrounding townships will be cared for and the danger to Detroit diminished.

In one corner of the grounds, two hundred and fifty feet away from the main building, are three "huts," technically so-called, sixteen by twenty-four feet, built of wood, solid, provided with water, sewerage, light, and warmth, in which eight or ten small-pox patients can be cared for well. Small-pox is epidemic only once in six or seven years. Sporadic cases in the long intervals can be cared for in these small buildings, while the main hospital can be devoted to other contagious diseases. The structure of all the buildings is such that they can be thoroughly and safely cleaned and disinfected in a few hours after long occupation by small-pox patients.

An eminent English sanitarian, a few years ago, expressed the wish that contagious disease hospitals might be constructed of "deal boards solid," as the safest and cleanest material. His idea has been first realized by the city of Detroit, with scientific precision of details and in an ingenious original form.—*Sanitary News.*

White into Gray Cast Iron.

M. Ferdinand Gautier has communicated to the *Comptes Rendus* some observations upon cast iron. He says that gray iron alone can be perfectly worked in foundries; the white iron being too hard. Gray can be transformed more or less completely into white iron by the chill, through the intermediary of a metallic mould which rapidly cools the metal, and makes the graphite pass into the state of combined carbon. But the inverse problem—that is to say, the industrial conversion of white into gray iron by special treatment (a process of fusion in the cupola, for instance), is not a current operation in the foundry. At the same time this transformation is of great importance, because by successive remeltings gray iron tends to become white, and thus to lose its value to the founder, and spoil his castings. M. Gautier has been struck by the experiment of Messrs. Stead and Wood, of Middlesbrough, who made a fluid and tough gray iron by the mixture of equal proportions of Cleveland white with a silicious pig; and he has repeated the experiment in France. His results are described as absolutely conclusive. By the addition of silicious iron to any variety of white iron, he succeeded in producing from the cupola a perfect gray metal, close grained, soft to work, very fluid, and in every respect suitable for moulding. The best kind of silicious iron for this purpose is shown by M. Gautier's experiments to be that which is freest from manganese; so that the Scotch iron which is commonly used to make a good, fluid metal may be advantageously replaced by one-quarter of its weight of 10 per cent ferro-silicium. In addition, it is shown by many experiments that the artificial gray iron made by thus precipitating the combined carbon of white iron is stronger, because of its homogeneity, than the natural gray iron, in which the graphite is more or less irregularly distributed.

The Heating Power of Gas.

A series of tests has recently been made by Dr. Fischer, the well-known German chemist, showing that in ordinary domestic stoves in use not more than 20 per cent of fuel consumed is really utilized for warming the rooms, whereas, with stoves burning gas, 80 per cent and more of the possible effect is obtained. In a sugar manufactory at Elsdorf, it is stated no steam engines have been used for several years. Gas is made at a cost of about 10d. per 1,000 cubic feet, and is used for lighting and driving gas engines. At the Essen works, water gas is made at a cost of 4d. to 8d. per 1,000 feet, and serves both for fire and lighting.

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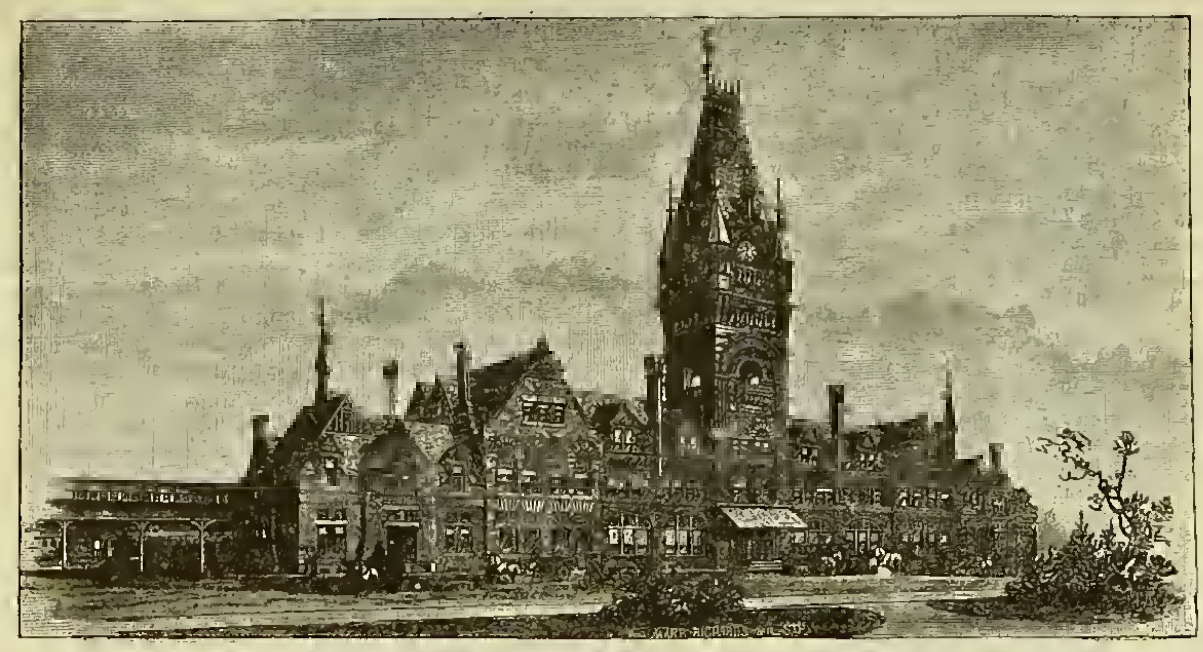
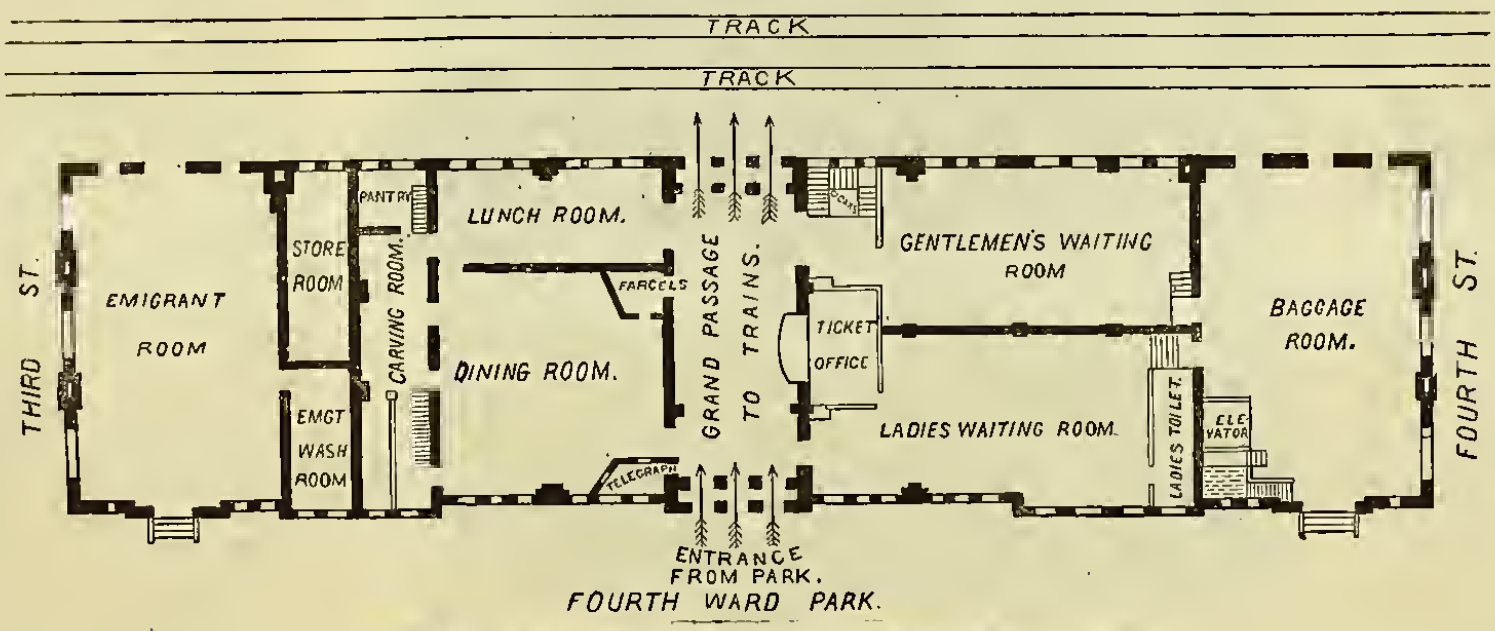
NEW PASSENGER DEPOT OF THE CHICAGO, MILWAUKEE, AND ST. PAUL.

The elegant new passenger station of the Chicago, Milwaukee, and St. Paul Railway at Milwaukee is now completed, and trains began running into it a few weeks since. It is among the finest buildings of the kind, as will be seen from the elevation and ground plan, which we illustrate. It is situated between Third and Fourth streets, one and one-half blocks from Grand avenue, and fronts on a park on Everett street. The ground plan of the building shows a surface of 120 x 65 ft. There are three floors—the first 16 ft. in the clear and the other two 14 ft. each. In the center of the facade rises a tower to the height of 160 ft., reminding one in its graceful lines of some Venetian campanile, and dominating the landscape in every direction. The style of the structure is modern Gothic. The foundations are solid and enduring, being constructed of stone, with granite facings above grade. The material used in the construction of the walls is Milwaukee brick, faced with pressed Philadelphia red brick. The trimmings are of red sandstone and terra cotta in handsome patterns.



NEW PASSENGER STATION OF THE CHICAGO, MILWAUKEE & ST. PAUL RY., MILWAUKEE.



GROUND PLAN OF MILWAUKEE PASSENGER STATION.

The main entrance of the building is formed of a triple arch, supported by columns of polished granite. It is reached by a flight of six easy steps. The swinging doors of polished oak are a few feet inside the arch, being surmounted by stained glass windows in beautiful designs. These admit the visitor into the large central hall which bisects the building. This is 30 x 65 feet. The floor is of tile, in a well defined pattern and soft, pleasing colors. The walls are of red brick up to the spring of the arch. From there on they are in a soft, creamy brick. The lower portion of the wall is marked with geometrical patterns in different colored brick, while the creamy surface above is picked out here and there with a dash of dark color, as Beauty enhances her complexion by a black patch. Around the rear of the hall runs a gallery, which serves to give the light and lightness needed to the whole. This gallery is surrounded by a railing in hammered dull brass.

On the right of the main entrance is the ladies' waiting room, an apartment of handsome proportions, 30 x 84 ft., with tile floor, and finished in oak in natural color. To the rear of the apartment are well appointed toilet rooms. On the same side of the hall, and occupying the south side of the building, is the gentlemen's waiting room, of the same size as the other room, less a slight abridgment in length. Between the two is a bijou ticket office. All these rooms, as well, in fact, as all the rooms down stairs, with one exception, are finished in a similar manner to the ladies' room, and have tiled floors. The ceiling on this floor throughout is ribbed by heavy beams, whose possible heaviness is relieved by tinting in light color approaching a soft shade of Nile green. On the left of the entrance is the dining room of the hotel connected with the depot, a room 40 x 52 ft., finished as the other rooms, but with a wood floor. The lunch room, on the same side, is 16 x 52 ft. in size, and is furnished with folding stools for the benefit of its patrons. Between the two rooms is the telegraph office and the parcel counter.

To the right and rear of the hall an alcove gives room for a handsome oak stairway that leads to the second floor. This, in the west end of the building, is occupied by the train dispatchers of the different divisions, and it is safe to say that never before did train dispatchers have more comfortable or beautiful quarters. The most of the offices look directly out on the park. The east end of the building is occupied, with the exception of one room, for hotel purposes. Descending to the first floor, in the extreme west end of the building is found the baggage room, an apartment 52 x 56 feet in its floor dimensions. Immediately above it, and reached by a water elevator, is a room of similar size for the purpose of storing baggage not called for immediately. In the east end of the building is the emigrant room, of size the same as the baggage room, with heavily timbered ceiling and tiled floor. This room and the one above it, also intended for the same purpose, are well appointed for their special object. The building is lighted throughout by electricity and heated by steam, both being furnished by boilers and engine located in the east end of the basement.

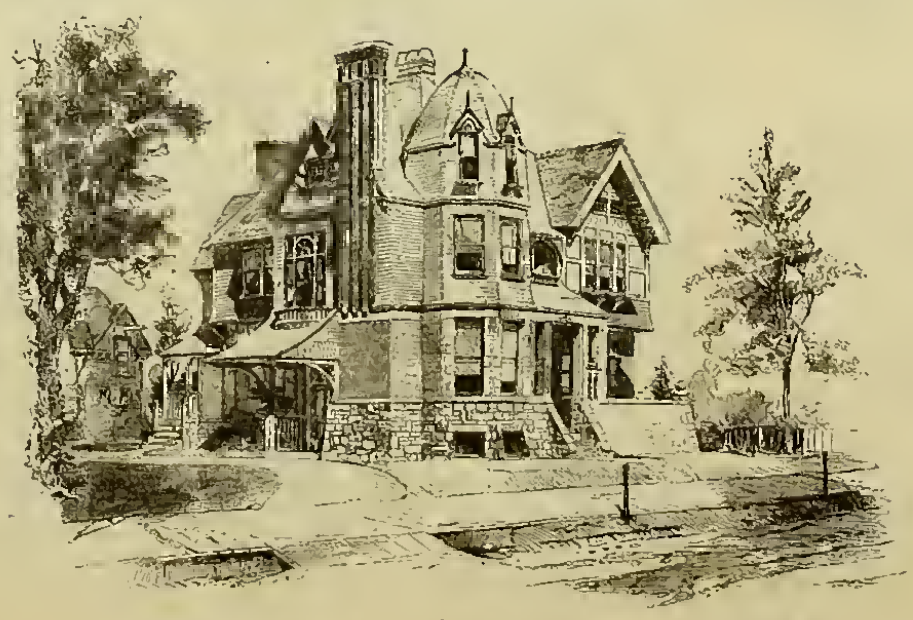
Outside are large car sheds, 600 feet in length and 100 in width, supported by iron columns and girders, and roofed with corrugated iron. They cover five tracks on which the highest skill of the road master's art has been displayed. There is placed in the tower, at a height that will make it easily seen from a good part of the city, a big clock, the dials of which will at night be illuminated by electricity. The clock is one of the finest as well as the largest in the country. It has four dials. Those on the north and south sides are 11 feet in diameter, and those on the east and west are 9 feet. Each of these dials is composed of six sections of the finest ground glass, so joined together as to appear one solid piece. The pendulum of this mammoth clock is 14 feet in length, and weighs 400 lb. It is regulated for heat and cold. The cost complete is $500,000.—*The Railway Review.*

MINNEAPOLIS RESIDENCES.

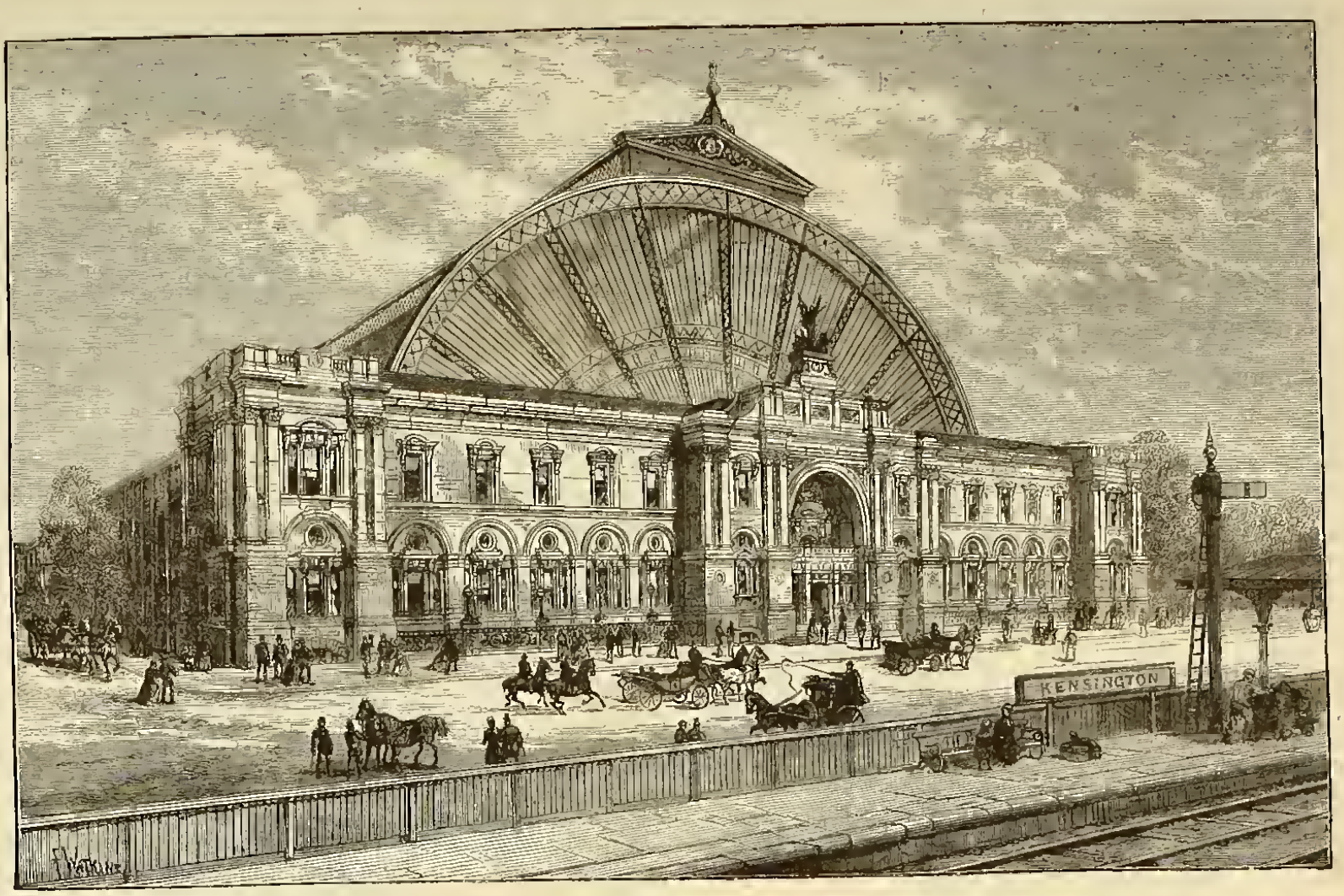
We give herewith a couple of attractive elevations of dwellings erected in Minneapolis, Minn., both by Mr. E. E. Joralemon, architect, of Minneapolis. For the drawings we are indebted to the *Northwestern Architect.*

A FENDER has been patented by Mr. Baker V. Butts, of Halifax, N. C. It is formed of an inner and outer plate and damper, and designed to attach to open fireplaces to prevent coal, sparks, etc., from snapping out into the room, while in no way interfering when thus used with the draught of the fireplace.

RESIDENCE FOR E. B. GALUSHA, MINNEAPOLIS, MINN.



RESIDENCE FOR W. ANKENY, MINNEAPOLIS, MINN.



OLYMPIA, THE NEW AGRICULTURAL HALL, LONDON—EXTERIOR VIEW.

OLYMPIA, THE NEW AGRICULTURAL HALL, LONDON—INTERIOR VIEW.

[For description see page 66.]

OLYMPIA.

Close to the West Kensington or Addison Road Station of the Metropolitan District Railway, London, on its western side, a few yards from the Hammersmith Road, a large range of buildings has been erected by the National Agricultural Hall Company, which is intended not only for exhibitions similar to those held in the Agricultural Hall at Islington, of live stock, cattle, horses, and dogs, but also for military tournaments, performances of horsemanship and gymnastic feats, and other public entertainments requiring space, and for a great variety of recreations. These buildings together cover an area of four acres, and will be popularly known as "Olympia."

The grand hall, two acres and a half in extent, is the largest hall in the kingdom covered by one span of iron and glass. It is 450 ft. long by 250 ft. wide, including an outer parade 40 ft. wide, affording a total ground floor area of 109,750 superficial feet, or nearly one half greater than the area of the Agricultural Hall at Islington. The galleries over the outer parade contain 46,000 superficial feet of floor space. The central area on which the performances take place is nearly a third of a mile in circumference. A minor hall forms an annex to the grand hall, and can be used separately for exhibitions, concerts, balls, theatricals, musical or other entertainments, while connected with the galleries will be spacious saloons for lecture rooms, picture galleries, refreshment rooms, public and private dining rooms, and offices.

The open gardens, comprising five acres and a half, are immediately adjacent to the hall. They will be devoted to fashionable gatherings, garden and floral fetes, musical promenades, and outdoor sports. One special feature of the company's programme will be high class musical performances in the open air, and Olympia will be in constant use, summer and winter, for any and every class of indoor and outdoor amusement, instruction, and recreation of a high style and character.

The facade overlooking the railway presents a handsome combination of red brick and white stone, and it is expected that an arrangement may be effected with the railway by which a broad and commodious road may be laid out in front of the new building from the station up to the Hammersmith Road. The station and the building will be connected by a short covered way, so that passengers by rail to Addison Road may pass directly into the hall in any kind of weather without inconvenience.

The hall is covered in by an iron roof, in which many ingenious novelties in engineering detail have been introduced by its designers. The structure consists of semicircular arched ribs 7 feet deep, and 170 ft. clear span, placed 34 ft. apart, and having a clear height from the floor to the crown of the roof of about 100 ft. It constitutes the loftiest iron and glass roof yet erected in or near London, the Crystal Palace excepted. The original architect was the late Mr. H. E. Coe, whose work has been completed by Mr. Edmeston. The contractors are Messrs. Lucas & Son. The engineers for the ironwork were Mr. M. Ende and Mr. Walmiston, and the contractors for it were Messrs. Andrew Handyside & Co., of Derby.

We give an exterior view of the building from the *Illustrated London News* and interior view from the *Graphic*. The latter shows the spirited scene enacted on the occasion of the recent opening entertainment, when 9,000 persons were present, and a team of thirty horses from the Paris Hippodrome were driven by a standing rider.

A UNIQUE SYSTEM OF WATER WORKS.

BY E. O. HOVEY.

As everybody knows, water is frequently raised to a desired height by means of a hydraulic ram set in a stream at the foot of a hill, or at the bottom of dam, or at some other place where there is a natural fall of water; but at Elk River, Minn., there is a peculiar arrangement, a description of which may prove to be of interest.

The town is situated at the junction of the Elk and Mississippi Rivers, thirty miles northwest of Minneapolis. The geological formation is the area of modified glacial drift of central Minnesota. About half a mile northeast of the station the railroad passes within a few yards of the southwestern edge of a tamarack swamp, in which water is found on or near the surface. For a long time it has been known that, within a limited area southwest of the railroad at this point, good water could be had at a depth of eight feet, while just outside of this area water could not be found short of eighteen feet. The idea occurred to Mr. T. S. Nickerson, who lives at Elk River, and is water supervisor of the Breckenridge division of the St. Paul, Minneapolis, and Manitoba Railroad, that a hydraulic ram might be set so as to utilize this difference of water level. Test holes twelve feet deep were sunk with an elongated post hole auger, at the points marked A, Fig. 1, to determine the location of the edge of the basin of water standing at eight feet. Water failed to come into these holes, but at the point, B, Fig. 1, water was struck at the required depth. The operations which pertained directly to the setting of the ram are of especial interest. On a line supposed to be perpendicular to the rim of the basin a ditch sixteen feet long, two and a half feet wide, and about twelve feet deep was dug to allow the water to flow off while the "supply" well was in process of construction. This well is twelve feet in circumference and twelve feet deep. The first six inches of the well and ditch were cut through the light and sandy but fertile soil characteristic of this region, the next six and a half feet through loose gray sand. Then, on the line between the well and the ditch, the diggers struck a dike two feet wide at the top, but soon increasing in width to four feet, composed of coarse sand so firmly cemented by infiltrated oxide of iron and carbonate of lime as to render the use of the pick necessary in removing it. This dike is impervious to water, and, as shown in Fig. 2, has an inclination at this point of about 75° south of west. Northeast of the dike the well passed through coarse gravel containing many large stones, while southwest of it nothing but the loose gray sand was found. In the coarse gravel a copious supply of water was met with, which flowed off freely through the loose sand of the ditch.

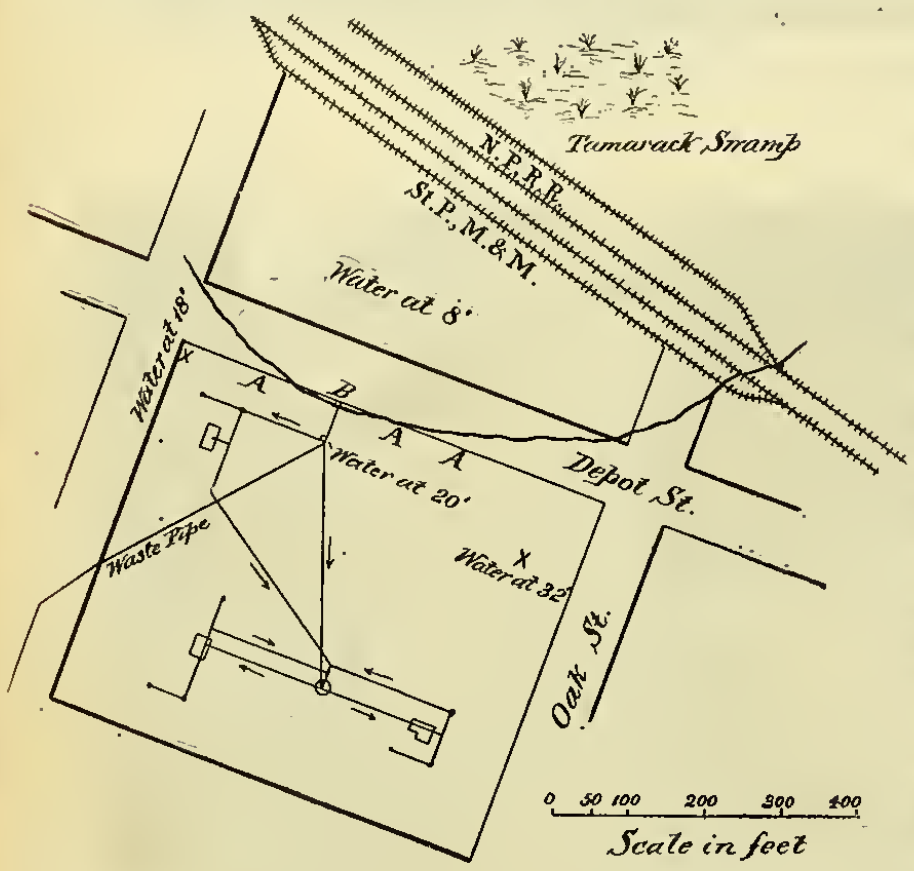


Fig. 1

A two and a half inch iron pipe was laid in the bottom of the well and ditch, the well was bricked up in the usual way, and the trench in the dike outside of the well was filled in with cement to make a water tight joint about the pipe and to prevent the washing away of the dike. Fifty feet southwest of this well another one, called the "waste" well, eight feet square, was sunk to the depth of twenty feet, and cairned to prevent caving. Water was met with at this depth, or the well would have been made deeper. A No. 6 hydraulic ram was then placed in the waste well at a depth of 16 feet, and was connected with the two and a half inch iron pipe mentioned above. The ram there has a head of water of eight feet, and it furnishes three houses and their dooryards with an abundance of water.

The arrangement of the pipes leading from the ram is illustrated in Fig. 1. Each pipe, after making the circuit of the house and dooryard which it supplies, is connected with a 250 bbl. tank, the bottom of which is 16 feet above the ground, which connection greatly increases the force of the stream at each faucet. In each pipe, after it passes through the house, there is a check valve to keep the water from flowing back from the tank through the house.

For about a year, *i. e.*, until the present summer, the waste water from the ram found free discharge through the loose sand surrounding the well; but lately the sand has seemed to be saturated with water, and drainage has not been sufficiently rapid. Therefore, some months ago Mr. Nickerson laid a two inch iron drain pipe from a depth of 18 feet in the waste well to a point 1,200 feet distant on the terrace of the Elk River, and the waste water is easily disposed of through this outlet.

The water within the basin is strongly impregnated with iron and has but little lime in its composition, while that from wells without the basin contains much lime and but little iron. The water from the tamarack swamp is like that found in the basin. The dike of coarse sand has been cut into at one other place, and found to trend in such a direction as to warrant the supposition that it forms a retaining wall on at least the southern and southwestern sides of the basin and tamarack swamp, thus preventing their waters from flowing off into the loose gray sand and descending to the general water level.

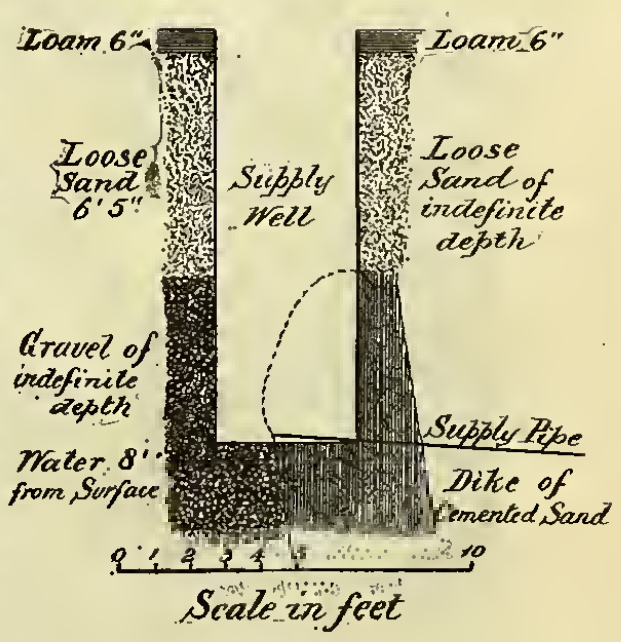


Fig. 2.

Curiosities of Alloys.

The way in which an alloy of gold and copper or other metal is affected by a small quantity of impurity presents one of the most serious difficulties with which our case makers and jewelers have to deal in working gold. It has long been known to workers in the precious metal that minute quantities of certain metals render it brittle and unworkable; and referring to this in a lecture at Birmingham, Professor Roberts-Austen, of the Royal Mint, said:

"It may be well to demonstrate the fact. Here are 200 sovereigns. I will melt them, and will add, in the form of a tiny shot, a minute portion of lead, amounting to only the 2,000th part of the mass; first, however, pouring a little of the gold into a small ingot, which we can bend and flatten, thus proving to you that it is perfectly soft, ductile, and workable. The rest of the mass we will pour into a bar; and now that it is sufficiently cold to handle, you see that I am able to break it with my fingers, or, at least, with a slight tap of a hammer. The color of the gold is quite altered, and has become orange brown; and experiments have shown that the tenacity of the metal—that is, the resistance of the gold to being pulled asunder—has been reduced from eighteen tons per square inch to only five tons. These essential changes in the property of the metal have been produced by the addition of a minute quantity of lead."

In the same lecture Professor Roberts-Austen said: "Here is a bar of tin, 2 ft. long and 1 in. thick, which it would be most difficult to break, though it would readily bend double. If only I rub a little quicksilver on its surface, a remarkable effect will be produced—the fluid metal will penetrate the solid one, and in a few seconds the bar will, as you see, break readily, the fractured surface being white, like silver."

A METHOD of purifying water has been patented by Messrs. William J. Morrison and John C. Wharton, of Nashville, Tenn. The invention covers a method of adding to the water a mixture of lime, soda, and sand, and then a mixture of alum, permanganate of potassium, and sand, the method being advantageous for all waters to be used for domestic purposes as also in the preparation of various beverages, and for steam boilers, laundry and bathing purposes.

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ARCHITECTS AND BUILDERS EDITION.

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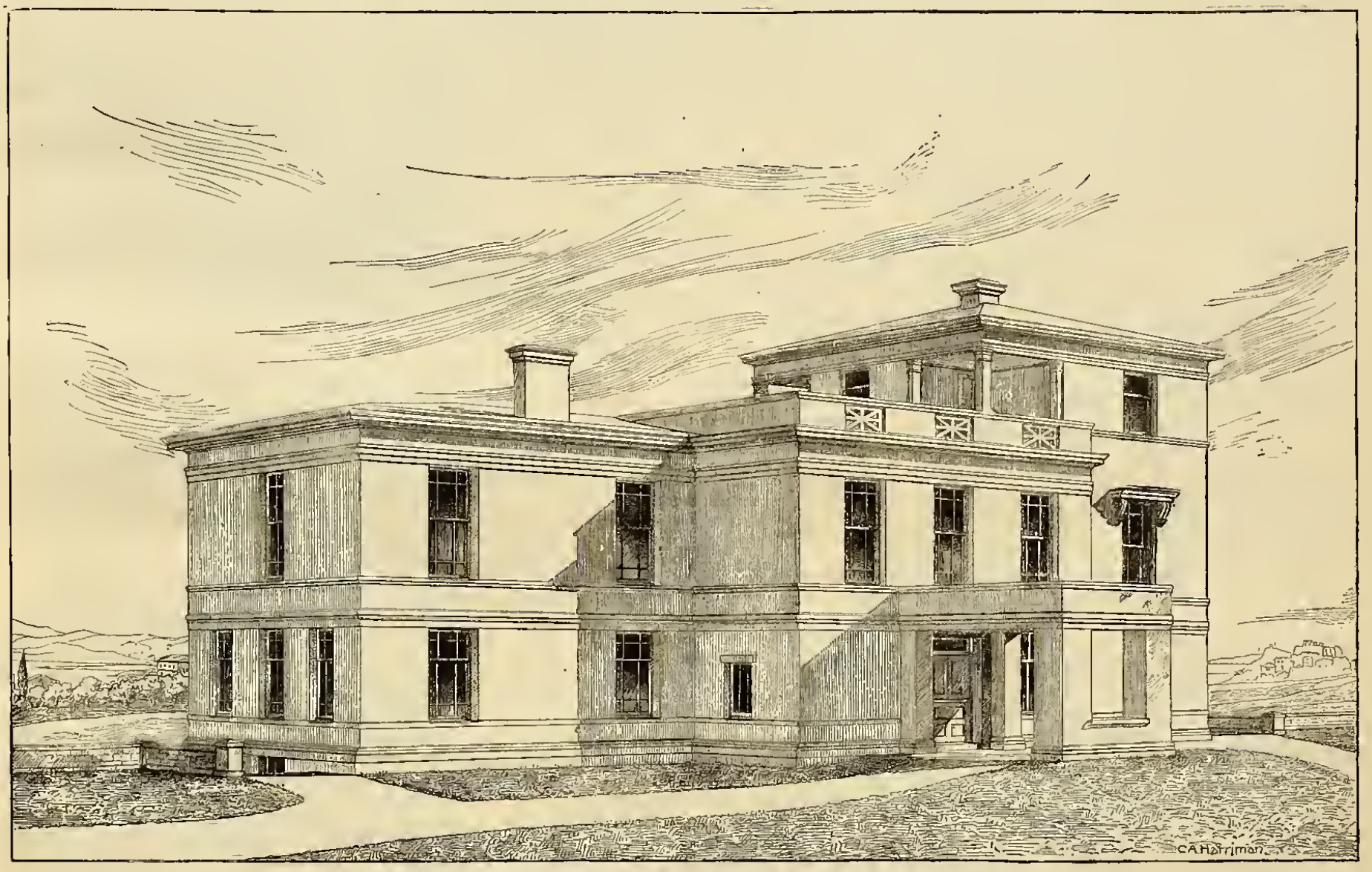
THE AMERICAN SCHOOL AT ATHENS.

In presenting a view of the building now erecting for the *American School of Classical Studies at Athens*, we desire to call attention not so much to the building itself as to the enterprise of which it is to be the seat. It is an undertaking of which every American may be proud, whether he regards the noble ends it has in view or the distinctively American method in which it is carried on. While other nations have founded in Greece schools for special archæological research, France having its school and Germany its institute, the American school aims to quicken, from the original fountain head, all those currents of life which had their origin in Greece, and which constitute the intellectual life blood of modern civilization. Here the student of the history, art, and literature of antiquity may, upon the field of their first triumphs, learn the better to understand them in making acquaintance with the scenes amid which they arose and the objects of which they treat. The country itself is the subject matter of a history and literature which can never be fully understood, and hence never taught with fullness of understanding, unless a visit to Greece has made it familiar. This, at any rate, is the testimony of those who have tried it. Says Professor Goodwin, the first director of the American school: "The whole literature of Greece is full of passages which can be fully appreciated only when they are read or remembered on the spot, in full view of the scenes which they describe. Where else than in Athens can the noble verses of the Attic poets, in which they celebrate their beautiful home, be so thoroughly understood? The historic scenes on which one looks down from Mount Pentelicus are far more vivid to the eye than years of study can make them We have here unfolded before us a map of Attica such as no Kiepert can draw for us. . . . What a change is effected in every student's mind when first he can substitute the glorious panoramas which he beholds from the Attic Hills, from Ægina, or from Salamis, for the maps which have hitherto represented these scenes to his mind!"

These advantages are even greater to the student of art, achæology, and architecture than to the student of history and literature, the matchless remains of art with which the country is covered surpassing nature itself in interest and charm. But Greece is the most inaccessible of European countries, and hitherto these privileges have been enjoyed only by an occasional student, traveling well out of the beaten path, to find himself without guidance or companionship in a field where guidance and companionship are specially needed. This want the American school will now supply. That the want has been felt, and that an actual demand exists for just these opportunities, the brief experience of the school has already sufficed to prove. Over a score of students have already availed themselves of its privileges. "These students," says a writer in the *Century Magazine*, "are now instructors and investigators in their own land, and have brought back the enthusiasm for their work which is so strengthened by the seeing of the eye, the touch of the hand, and a general experience of classic lands. One of them, by the generosity of Miss Wolfe, was enabled to extend his researches to Asia Minor, from which he brought away a collection of over nine hundred inscriptions, which, in the opinion of the great European epigraphists, is second to no other in historical value, and will, when edited and published, add great luster to American scholarship in the person of Doctor Sterrett."

The school is now supported by the annual contributions of no less than sixteen American colleges, which take turns in sending out an Annual Director. But it is obvious that this is but a temporary experiment, to try the ground; and the trustees of the school, of which Mr. James Russell Lowell is chairman, are proposing presently to obtain for it an endowment sufficient to support a Permanent Director. Dr. Charles Waldstein, of New York, now Director of the Fitzwilliam Museum at Cambridge, England, will become director of the school in the autumn of 1888, provided a sufficient sum is secured by that time.

The building contains a home for the Director, and in a wing, shown on the left of the drawing, rooms for half a dozen students, more or less, on the lower floor, and above, a large library. For this, fifteen hundred carefully selected volumes are already in hand. Close by is the English school, founded in imitation of our own, and already ready to enter into friendly rivalry with it. The best relations obtain between the two schools, the students of each frequenting the exercises of the other. As the director of the British school is the eminent architect, Mr. Penrose, it will be seen that for students of architecture the opportunities of study now opened are beyond all comparison with what has hitherto existed. The design for the American school was prepared by Professor Ware, of Columbia College, and the building is going up under the supervision of Mr. S. B. P. Trowbridge, a graduate of the Department of Architecture in the School of Mines, and now a student in the Athens school. It will be finished during the coming summer. It stands on the southern slope of Mount Lycabettus, on the eastern outskirts of the city, in ground given to the school by the Greek government, and commands a prospect of surpassing beauty.



THE AMERICAN SCHOOL OF CLASSICAL STUDIES AT ATHENS.

Strength of Brick Walls.

The question of strength of brick walls is often discussed, and differences of opinion expressed. The following is one of the rules given: For first class buildings, with good workmanship, the general average should not exceed a greater number in height than three times its thickness of wall in inches, and the length not to exceed double the height, without lateral supports of walls, buttresses, etc., as follows, for safety:

Thickness.	Safe Height.	Length.
8½ inch walls	25 feet.	50 feet.
13 "	40 "	80 "
17 "	55 "	110 "
22 "	66 "	130 "
26 "	78 "	150 "

Where the lengths must exceed these proportions, as in depots, warehouses, etc., thickness should be increased, or lateral braces instituted as frequently as practicable.

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THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

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Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

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In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

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A COTTAGE ADAPTED FOR FUTURE ENLARGEMENT.

A problem of almost every day occurrence is the alteration and enlargement of existing buildings. A dwelling may be erected by a man for the accommodation of his small family, and a few rooms be quite sufficient for his wants. But, with increasing years, his family augments, and he finds it necessary to either build a new house or to enlarge his old one. There are, generally, many reasons why he should do the latter. The individual and family associations connected with the old house render him anxious to preserve it in detail as far as possible. Then, on the score of economy, he will wish that the old structure should be utilized.

To make extensive additions to a house under these circumstances is not, as a rule, easy; but that, with a little foresight, provision may be made for such a contingency, is shown by the design represented in the colored plate accompanying this number.

Here we have a house complete in itself, and pleasing in appearance, which may be readily added to without in any way interfering with the existing building, or necessitating the waste of material. This would be effected by building on the left hand wall. Exactly how it is proposed that it should be done will be shown by full drawings in a future number. As it is now represented, the little house would be a convenient and attractive one.

Below is an estimate and bill of quantities, showing the cost of the house to be $1,819.37. These prices are based upon the high current value of labor and materials in New York and its vicinity. In many localities the house might be erected for a good deal less.

The full specification given below, and the sheet of detail drawings and elevations clearly indicate the precise construction of the building.

This design has been specially prepared for the SCIENTIFIC AMERICAN by Mr. Christopher Myers, architect.

ESTIMATE AND BILL OF MATERIALS, AS PER SPECIFICATION BELOW.

MASON'S WORK, ETC.

		At.	
92	yards excavating	$0 25	$23 00
43	perches stone	4 50	193 50
	Cement bottom	....	15 00
2	piers in cellar	3 50	7 00
4	outside piers	3 00	12 00
2	stoop stones	4 00	8 00
2	chimneys complete	37 10	75 00
5	window sills in cellar	....	4 00
	Cellar steps and copings	...	20 50
726	yards plastering	40	290 40
	Cistern	....	40 00
	Cesspool	....	20 00
	Drains, as specified, complete	....	20 00
	Total		$728 40

CARPENTER'S WORK.

Timber Bill.

No. of Pieces.	Size.		Description.
1	6" × 8"	×20'=	80 trimmer.
3	3" × 8"	×12'=	72 sills.
1	"	×16'=	32 "
1	"	×24'=	48 "
1	"	×14'=	28 "
1	"	×30'=	60 "
8	4" × 6"	×22'=	352 posts.
2	"	×20'=	80 "
3	4" × 4"	×16'=	64 ties and plates.
3	"	×14'=	57 feet ties and plates.
1	"	×24'=	32 " " " "
6	"	×12'=	96 " " " "
2	"	×19'=	50 " " " "
20	2" × 10"	×16'=	540 " beams.
36	"	×21'=1,260	" "
10	2" × 9"	×16'=	240 " "
18	"	×21'=	567 " "
20	2" × 6"	×21'=	420 " rafters.
19	"	×16'=	340 " " and collars.
6	"	×18'=	180 " "
1	3" × 6"	×16'=	24 piazza.
1	"	×22'=	33

4,547 feet spruce at per M. worked..$28 00 $127 32

425	2" × 4" × 12" studs = 3,400 feet hemlock	24 00	81 60
800	feet hemlock boards for roof, put on finished	20 00	10 00
800	slates, put on, per foot	7	56 00
2,000	feet sheathing and paper, put up	22 00	44 00
1,500	feet siding, at per M	85 00	52 50
600	" shingles on side, at per foot.	6	36 00
200	" main cornice and gutter	30	60 00
100	" band course	20	20 00
130	" water table and piazza fascia	10	13 00
50	" piazza gutter cornice and plate	30	15 00
2	back piazza columns	....	3 00
1	short post on back piazza	....	$2 00
10	feet rail and balusters, back of piazza	$0 20	2 00
13	" filling in back piazza	30	3 90
2	turned columns front piazza	2 25	4 50
1	" short column	....	2 00
13	feet rail front piazza	30	3 90
6	brackets for same	25	1 50
100	feet piazza floor, ceiling, roof trimmed	....	25 00
	Stoops, lattice, steps, etc., complete	....	18 00
7	cellar windows complete	....	12 25
13	windows on first story	8 00	104 00
11	" " second story	7 00	77 00
4	" " third "	5 00	20 00
2	flights of stairs complete	....	75 00
	Cellar stairs	....	4 00
300	feet of surbase	....	12 00
6	closets complete	...	18 00
	Front door complete	...	10 00
7	doors, first story	5 50	38 50
6	" second story	5 00	30 00
4	" third "	4 50	18 00
	Pump and sink	....	25 00
	Incidental expenses	....	60 00
			$1,090 97
	Mason's work, as above		728 40
			$1,819 37

SPECIFICATIONS.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, so that any work shown on the drawings, and not mentioned in the specifications, or *vice versa*, is to be executed the same as if both mentioned and set forth, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever. The drawings in connection with this specification are intended to provide for the completion of the entire carpenter, mason, painter, plumbing, slating, tinning work, etc., and everything mentioned in this specification.

Quality.—All materials used to be of good quality, free from all defects impairing their strength and durability. All timber, except where otherwise specified, to be of good, well seasoned spruce.

MASON'S WORK.

Excavate cellar to average depth of about 3 ft., the soil to be put in a separate pile for future use. Other dirt to be roughly leveled off at sides, and in front of house. Cistern and cesspool earth to be left in heaps.

Foundation Wall.—To be 16 in. thick, laid up with quarry stone, of good size, to the height of 7 ft. in the clear. Angles and corners to be plumb and true, perfectly level on top. No footing course under foundation wall. Build and excavate for piazza piers at least 2 ft. 6 in. deep.

Bluestone.—Furnish bluestone sills for all cellar windows.

Stone Walls.—All stone wall to be laid with sharp sand and lime mortar, using small quantity of cement. Stone work to be pointed inside and out. The outside to have cut cement joints. Furnish and set bluestone cellar steps with brick risers and brick walls, and capped on top. Piazza piers to be brick.

Chimneys.—Build chimneys, as shown on plans, of good, hard Jersey brick, laid in good sharp sand and lime mortar. Select best bricks for topping. Chimneys to have Portland cement caps moulded on. Build brick piers under girder.

Lath and Plaster the entire first, second, and third stories. Mortar to be made in best manner for first class work, well put on, hard finish, to be gauged high. First and second stories to be three coat work, to wit, scratch coat, brown, and hard finish. Attic and closets to be laid on and hard finished.

Thimbles.—Furnish and set all necessary thimbles for chimneys.

Stoop Stones.—Furnish and lay on good foundation two good stoop stones of proper size.

Cistern.—Build cistern of common brick, 9 ft. by 9 ft. in clear. Manhole in top, with bluestone to cover. Cement inside in best manner, and warrant perfectly tight. Place stone at bottom for water to strike on.

Cesspool.—Build cesspool, where directed, about 50 ft. from house, of rough stone laid in dry, with stone at top 5 ft. by 6 ft. in the clear. Do all necessary excavation, and lay 3 in. drain tile from foundation wall to cesspool, with cemented joints.

Drain.—Do all necessary excavation, and lay 3 in. tile from discharge of leaders to the cistern. Cement joints, and fit into cistern all complete.

Chimney Flues.—All joints in chimney flues struck smooth. Do all necessary patching after other trades are through, and leave the house in good order all complete.

CARPENTER'S WORK.

Sizes.—Girder to be 6 x 8 in.; sills, 3 x 8 in.; plates and interties, 4 x 4 in.; posts, 4 x 6 in.; first and second floor beams, 2 x 10 in.; third tier 2 x 9 in., all 16 in. on centers; rafters, 2 x 6 in.; hip and valley rafters, 3 x 8 in., 24 in. on centers; all studding 2 x 4 in., 16 in. on centers.

Framing.—Frame the building in the strongest

manner, in accordanee with the drawings. All joints to be elosely fitted and the frame mortised and tenoned together. Fasten with spruee pins well spiked.

Floor Beams.—Each tier of floor beams to have one row of bridging, aeeurately eut and well nailed at each end. Beams to be doubled under partitions running parallel. Headers and trimmers all double.

Studding.—All studding placed 16 in. on eenters, door and window studs to be double bridged onee on each floor. Partition studs to rest on partitions below wbere possible, and not on the floor beams.

Sheathing.—The entire frame, from sill to plate, to be sheathed witb 1 in. rough hemloek boards, put on diagonally, and well nailed at every post and stud. This to be eovered with No. 30 Manila building paper, well lapped and laid under door and window frames.

Flooring.—First and second floors to he laid witb narrow spruee flooring, well driven togetber and nailed to eaeh beam. Attic floor to be pine, 9½ in. wide, well driven together and nailed to eaeb beam.

Siding.—Cover entire building, except wbere otherwise shown in drawings, witb sound and clear No. 1 beveled clapboards, 4 in. to tbe weather, nailed every 16 in., and set nails for putty. Shingle vertieal sides wbere shown witb 18 in. xxx pine shingles, laid not more than 5 in. to the weather, and clipped as shown on the plans. Do all necessary furring. Set grounds for all doors.

Roof.—The roof is to be boarded with sound rough hemlock boards. Covered with tar felt. Valleys and gutters to be lined with I. C. chareoal tin, all joints to be carefully soldered. Do all neeessary flashing around ehimneys, dormers, bay windows, porches. etc. Slate the entire roof with 8" x 16" blaek slate. Put up where required 3 in. tin leaders, connected with drains where directed.

Piazza.—The sill and bearing beams for porehes to be 3 x 6 in. Floor beams 2 x 6 in., placed 20 in. on centers. notched into the sill and well nailed. Tbe floors to be 1 in. thick, 4½ in. wide, laid in paint, and blind nailed. Steps to bave 1¼ in. treads and 1 in. risers. The roof to be ceiled and tinned. Columns, plates, bolsters, ceiling, etc., to be wbite pine worked and trimmed as per detail. Piazza eeiled on tbe under side.

Blinds.—All windows except eellar to have 1¼ in outside blinds, made, hung, and fastened in best manner.

Exterior.—The water table, corner boards, cornices, window frames, bay windows, porches, and all other exterior ornamental work, to be made of the best quality wbite pine, in accordance with drawings. The ends of rafters overbanging the plate to be worked as per detail.

Window and Door Frames.—Window frames to be made for 1½ in. double hung sash, with 1¼ in. pulley and hanging stiles. 2 in. sills and ⅞ in. sub-sills. 1¾ in. axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted jambs, cased inside and hung at top with 3 in. narrow butts, and proper fastenings. Door frames to be made of 1¼ in. plank with rabbeted jambs. Outside doors to have 1¼ in. casings.

Sashes.—All sashes, exeept cellar, to be 1½ in. thick. Dimensions and number of lights as sbowing in plans. To be glazed witb seeond quality French sbeet glass. Cellar to be glazed witb third quality. The double hung sasb to have best Russian hemp eord. proper weights, and Berlin bronze sasb fasts. Size and number as per plan.

Doors.—The front doors to be 2 in. thiek, moulded, and as per plan. Upper panels to be glazed, hung with 4 in. east loose butts, fastened with 4½ in. mortise lock, brass face, wbite porcelain furniture, niekel plated seats and drop eseutcbeons, brass flush bolts top and bottom. Second floor closet doors 1¼ in. thick, paneled and moulded one side. All otber doors, 1½ in. thick, paneled and moulded both sides, hung with 4 in. loose joint butts, fastened witb 4½ in. mortise loeks, porcelain furniture, etc. Locks for closet doors to be reverse bevel rim locks. All doors, wbere needed, to have hardwood, rubber tipped stops, and asb saddles.

Stairs.—Build the main stairs as shown on the plan, from first to third stories, with 1¼ in. treads, ⅞ in. risers, 1¼ in. strings of wbite pine, to be put up in tbe best manner. The steps wedged. To be snpported on strong carriage timbers. Newels, band rails, and balusters made of ash, as per details.

Trimmings.—The architraves for all doors and windows throughout the bouse to be made 5½ in. wide, moulded on face. First and second stories to bave turned corner blocks in the attic. The bases to he 7½ in. wide, moulded on top, all to be of clear, well seasoned white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on two sides, as directed. Bed room closets to bave one shelf with strip, with japanned hooks.

Kitchen Sink.—Kitchen sink to be 18" by 36", east iron, with No. 2 "Douglass" lift pump, fitted and cased properly, with proper suction and disebarge pipe complete.

Finials.—Put up metal finials where shown on tbe elevations. These to cost $3 eacb.

Generally.—Do all work necessary to completely finish carpenter's work.

PAINTER'S WORK.

All the exterior woodwork usually painted, including privy, to be painted two good eoats of white lead and linseed oil paint. All knots and sap to be well shellacked before painting. All cracks, joints, and nail boles, and over nail heads to be well puttied after priming is done. All tin work to have two coats of "Prinee's" metallic paint. Also paint the ehimneys two coats. All the colors to be seleeted by the owner. The blinds will be painted at the faetory. The interior will be wood filled witb "Wheeler's" wood filler, tben two good coats of hard oil. Stair rails and balusters will be rubbed down to a smootb surface. All the doors, saddles, hearth borders, and hard floors will be oiled. All sash and outside doors must be painted on top and bottom. Tbe paiuting to follow immediately after tbe carpenters.

AN EAST ORANGE HOME.

One of the most admired residences of the many picturesque ones found in East Orange, N. J., is the house of F. W. Coolbaugh, erected last year, on Burnett Street, whieb forms tbe subject of illustration in our eolored plate and sheet of details in tbis issue. Located in a slightly elevated position, at a well judged distanee back from the road, the house at onee gives tbe impression of being essentially a handsome one. The whole effect is well eoneeived, and exhibits evidenee of mueb eare and tbought having been expended upon it, wbile many of the minor details are of a novel and interesting eharacter.

Coming to the interior, one is immediately struek with the eomfortable and homelike appearanee and arrangement of the rooms, whieh open into one anotber, and are well caleulated for tbe aeeommodation of guests. The kitchen leads off from the dining room, and a small serving lobby is placed between them, as shown upon tbe plan.

The hall is very prettily arranged, tbe eonstruction of the staircase being particularly novel and pleasing. This is executed in hard wood, and is formed with a quarter space, raised three steps up, and approached from two sides, viz., either from the entrance door or dining room, as will be understood on referenee to tbe plan. On the seeond story four good sized bed rooms are provided, with bath room and ample space for closets and trunks. The top floor contains servants' and other rooms, as represented.

The decoration of the house is earried out in a very superior manner. In the vestibule the walls are eovered with stamped paper in imitation linerusta walton; while the hall is provided with a dado and a filling of embossed paper. Most of the rooms are decorated in well chosen metal hangings, with deep friezes, and tbe ceilings are finished in light one-colored papers and borders. In several of the windows stained lead ligbts are used, with eharming effect. Some of tbis work is of a description not often seen, being partly composed of broken pieees of thick colored glass set in the lead work, and giving the appearance of crystals. Tbe design of the lead ligbts in tbe window in diming room is shown in our supplementary sheet. Set in the wood work of piazza are several rondels of colored glass, which aid in producing the good effect.

Among the special features in the house which greatly add to its comfort and completeness is a very nieely designed buffet, built in hardwood and fitted in the dining room, in tbe space underneatb the stairs. Fitted wash basins, with marble tops, are provided in tbe dining and several of the other rooms, there being five in number altogether. A large heater, built in brickwork, is provided in tbe cellar, with registers in tbe balls and all the principal rooms, and tbere are grate fires in tbe library and parlor in addition. Tbe mantel pieees are of excellent design, and are represented in our sbeet of details. Electric bells are fitted throughout in a most eomplete manner, the servants' call being so arranged that on pressing tbe button three bells in different parts of the house may be made to ring simultaneously. The drains are all ventilated with cool air spaces, and are built with special openings designed for tbe purpose of access in case of stoppage.

The cost of the house to duplicate would be about $5,000. Mr. Coolbaugh spent a total of some $6,000 in its erection, tbe extra sum being expended in decoration and plumbing, both of which are of a very superior kind. The original estimates on the drawings and specifications did not exceed $5,000.

The acting architect was Mr. George Cooke, of Orange, although to the talented wife of the owner, Mrs. F. W. Coolbaugh, is due the credit of arranging the general design and of planning the rooms. Indeed, to tbat lady is to be largely attributed the completeness and sueeess of the whole structure.

Cooke & Berryman, of Orange, were tbe carpenters; Henry Dickson, Newark, N. J., mason; Orren Ford & Son, of E. Orange, decorators; and George Southward, of Montclair, N. J., the plumber, to whom much credit is due for the excellency and eompleteness of his work.

SPECIFICATION

of the work and materials requisite in the ereetion of a frame dwelling for F. W. Coolbangh, Esq., to be located on the east side of Burnett Street, East Orange, N. J.

CARPENTER'S WORK.

Timber.—Sills, 4"×10". Posts, ties, and plates, 4"×6". First and second tiers of beams, 2"×10". Third tier, 2"×9". Rafters and long collar frames, 2"×6". Collars in gables, 2"×4". Valley rafters, 3"×7". Floor beams, 16" from centers. Third tier of beams to rest on 1¼"×5" ribbons, let into stud, and to be well spiked to stud wbere possible. Piazza sills and ties 4"×8" beams, 2"×8", on 2" eenters. Door and window stud, 2½"×4". All other studding, 2"×4". All framing lumber to be of spruce. All studding of hemlock. Girders in eellar, 4"×8". All framing to be done in best manner, mortised, trimmed, pinued, spiked, ete. Cut in large braces. Where neeessary, trimmers, headers, and beams under partitions to be doubled. Piazza plate, 3"×8". Rafters and collars, 2"×6".

Bridging.—All beams having a span more tban 10 ft. will have one row of herringbone bridging, 1¼×2, nailed with two nails at eaeb end.

Furring.—Do all neeessary furring.

Sheathing.—The entire frames and all roofs will be sheathed witb tongued and grooved bemlock, well driven up and nailed with two eigbtpenny nails at eaeb bearing. Cover all plumb parts with resin sized sbeathing paper.

Outside Trimmings.—As sbown on elevation. Water table in two parts. Belt courses will be formed by eontinuing the outer meinbers of piazza corniee around tbe house. Second story will be eontinued around main house, and have 2" mould under same, as shown. Sawed ends of rafters eeiled on top with 1" eeiling plinth and 4" crown mould, to be continued around all parts, as shown. Gables will be finisbed with banging verges, brackets, rafters, etc. Brackets to be beaded on face, and bave turned rosettes on sides. Gutters will be formed with 1"×5" plinth, 1"×3" mould, and 1"×2½" cap. All gutters will be lined to form descent to outlets, and 1½" sawed gutter ends, as shown. Cresting on main ridge of house will be formed with overlapping 1" pine pieees, with 4" roll on top, and have 6" trimmings at ends, as shown. All other ridges will bave 2" roll for quirk. Galvanized iron vane in frout gables. Dormers will be cased up, as sbown, and have eornices to matcb main eornices.

Inclosure.—The plumb sides of house will be covered with 6" beveled siding, with ¾" lap, well nailed at each bearing, where shingles are shown, and they will be of even width, and cut to pattern, and smoothed on face.

Roof.—The main roof will be eovered with 8"×16" No. 1 ribbon slate portions, to have clipped corners. Do all necessary flashing around dormers and chimneys, etc Counterflasb chimney. Slate laid in tar paper.

Tinning.—All gutters, valley, balcony floors, and veranda roofs will be lined with I. C. charcoal tin, well fitted and soldered. Put up 3" tin leaders to all outlets to convey water to ground. Tin back of all ehimneys.

Piazza.—Floor will be laid with 1×4½" tongued and grooved pine. Ceiled overhead with ½×3 leaded ceiling. Floors to be uosed on edge, and have 1" fascia and eove under same. Steps and strings will be 1¼", sizes ⅞". Plate will be boxed and be 6×8". Cornices, as shown, with ⅞" soffit, 1×5" drop and cap, 3" crown mould, 2" bed mould. Form gutters at eaves same as main house. Columns 6"×6" whitewood, turned newels, 5"×5" turned caps. Spindies, as sbown, 1"×1¼", with 1½"×2" bar under, and 2" sawed brackets. Square turned balusters, 2½"×4", beaded top rail, 2"×3" bottom rail. Space between piers will be fitted with ⅜"×2" lattice, with 1"×4" frames to same. Build back stoop, as shown, with 1"×4½" floor fascia posts, steps, and railings, etc.

Windows.—Tbe frames will be made in tbe usual manner; 1¼×5 easings, 1¼ jambs, and blind stops. ½" parting strips, 2" main sill, 1" top sill, 1¾ axle pulleys, pockets, etc., complete. All other sash will be 1½" tbiek, glazed with French sheet glass, double tbick for large lights. Sash on stairs and center of dining room bay will be glazed with leaded stain glass. All meeting rails 1½" thiek, with burglar proof bronzed sash fasts on same. Sash will be hung with Russian hemp cord and east iron weights.

Blinds.—All windows above cellar less than 3 ft. wide, except stained glass windows, small dormer, and quarter circle windows in front gable, will have rolling slat binds, made, hung, and fastened in best manner, and painted two coats.

Doors.—Front doors made of pine as shown, 2" tbick, upper panels filled with cathedral glass. Vestibule doors to have leaded cathedral glass to cost $? per foot. All to have suitable frames, jambs, etc. Sliding doors 2" thick panels, not more than 10" wide, all other doors four paneled, closet doors 1¼" tbick, all others not otherwise described, 1½" thiek.

Floors.—First and second floors will he laid with 1" × 4½" tongued and grooved pine flooring, free from loose knots and all bad defects, well driven up and blind nailed to eacb beam. Attic floor may be of wider pine.

Stairs.—Will be constructed as shown, of white pine lumber, 1¼" steps and strings, ⅞" risers, 6" main newels, turned 4" pedestals, turned caps 1½", turned balusters 2½" × 4", moulded rail, newels, rail, and balusters of dark ash. Seat side of stairs, with lid to lift, hung with brass butts. Hat closet over seat, cased in and have door paneled. Closet under first platform. Back stairs to cellar, of pine, 1¼" steps and risers. Main stairs to be furred and plastered underneath, steps to have nosings and cove.

Trimming.—Door and window casings throughout the house will be 4¾" wide, moulded and headed on face, and have neat turned corner blocks. Windows in hall, parlor, library and dining room will have moulded panel backs. All others will trim on neat mould nosings, with moulded aprons under same. Base on first story will be 7" wide, beaded on face, and have 1½" mould on top, mould to continue around trim. Base in second story 6", other parts 5". Neat moulded chair rail to continue around hall and dining room. Wash tub lids clauped, and hung with brass hinges and screws, turned legs under same. Kitchen sink to have pine apron and ash cap and drip grooved.

Bath Room.—Will be wainscoted with ½" × 2½" pine 3' 6" high with rabbeted cap. Face of tub and basin same. Basin to have door under. Brass butts and small cupboard catch.

Sundries.—Put down hardwood stoppers and saddles to all doors, also angle heads to all corners needing them. Build coal bin as shown.

Privy.—Privy 5' × 5'. to be built of ceiling boards, joints battened. Shingled roof. To have floor, and seat, with two large and one small hole, with lids on same. Panel door, hung with butts, and have lock and key.

Hardware.—All doors to be hung with loose pin steeple tip butts, and furnished with mortise or rim locks, as the case may be. All 1½" doors to have mortise locks. Front door lock to have night works complete, with bronze knobs and escutcheons. Porcelain knobs in first and second stories, with silver mountings. Kitchen and attic, japan trimmings. The sliding doors to have patent spring flush handles and locks bronze.

MASON WORK.

Cellar.—Excavate about 3 ft. earth, leave on premises, and level to a grade line against house. Excavate for cesspool, drain pipes, privy vault, etc.

Foundation.—Wall, up to grade line, to be laid up with good building stone and mortar. The balance of good hard burnt brick and good mortar. The stone wall will be 16" thick, the brick 8". Earth to be well rammed around foundation.

Piers.—To be as shown on drawings. Plaster on top of wall inside of sill with good cement, to keep cold air out. Put down cement bottom in cellar, of good cement and gravel, to the depth of 2½".

Bluestone.—All window sills, copings, steps, cesspool cover, chimney caps and stone at bottom of stoops, hearth in kitchen, to be of suitable thickness bluestone.

Walls.—To be covered throughout with two coats scratch brown sand finish. Mortar to be made up at least five days before using. Plaster two rooms and hall in attic.

Cesspool.—Build cesspool 6' × 8', laid up with building stone.

Drain Pipe.—Lay five vitrified tile pipe, 17 ft. distance, to cesspool, to take waste water from closet sink.

Chimney.—Topped out with good hard burnt brick. Hackensack red mortar. Mason to build in all hot air pipes required furnished by the plumber.

Cement Bottom.—Cement cellar bottom with ⅓ Portland, ⅓ Rosendale cement, and ⅓ sand, 2½ inches thick. Cement under foundation before wall is laid, and extend cement, etc., inside of foundation.

PLUMBER'S WORK.

Soil Pipe.—From five feet outside of cellar wall furnish and lay a 5" cast iron soil pipe, and connect in cellar with a 5" cast iron running double hub trap, with 4" double vents. From cesspool side of trap extend a 4" galvanized iron pipe outside of house to the highest point of roof, and there cap with ventilation cap, for cesspool vent. From the end of the trap reduce the iron pipe to four inch cast iron pipe, and from that point run a 4" cast iron pipe through the bath room to roof, leaving all necessary Y branches for fixtures in bath room, and cap with ventilating cap.

Soil Pipe Connection.—All joints to be packed with oakum and calked with hot lead. All lead connections to be made to iron pipes to be done with brass ferrules soldered on the end. Fresh air vent from trap to be carried up in cellar high enough so that a four by four T can be put in, and from said T carry a 4" pipe to outside of cellar wall for fresh air vent. On top of said T calk in a 4" trap screw for cleaning trap when necessary. Run all necessary lengths of 2" cast iron pipe to receive the wastes from sink and wash trays, and connect to cast iron pipe in cellar.

Boiler.—Furnish and set up one forty gallon dome headed copper boiler, best make, set upon Lockwood's boiler stand, and connect the same with water back of range by ¾ AA lead pipe.

Wash Trays.—Supply three stone wash trays, with hot and cold water, through ⅝ AA lead pipe, and ⅝ flange and thimble wash tray hibs and 1½ inch wash tray plugs, and necessary length of 2" lead waste pipe and 2 inch "Dubois" lead trap, connected to 2 inch iron pipe, with brass ferrule in cellar.

Sink.—Furnish and put up in kitchen one 30"×20" crockery sink. Second, 6" deep, with iron back, hot and cold water through ⅝ AA lead pipe and ⅝ compression flange and thimble hits. Waste through 2" D lead pipe and 2" "Duhois" trap.

Bath Tub.—Furnish and supply one 14 oz. copper, tinned and planished bath tub with hot and cold water through ⅝ AA lead pipe and nickel plated double compression hath bib, waste through 1½" lead pipe and 1½" "Duhois" lead trap.

Wash Basins.—Furnish and fit up two of the best Italian marble slabs, one 30"× 22" oval bowl, and one corner slab 1¼" thick, countersunk and polished, with back 12" high; supply the same with one 14" patent overflow marble basin, with hot and cold water through ½" AA lead pipe and nickel plated handle compression basin cocks, with nickel plated plug, chain, and chain stay. Waste through 1½" lead pipe and 1½" "Duhois" lead trap.

Hot Water Pipe.—Connect a ⅝ AA hot water pipe from boiler. Make all connections in said pipe for kitchen sink, wash trays, hath tub, and basin. Run a ¾ AA lead pipe from main supply pipe to bath room, to supply the same fixtures with cold water.

Ventilation.—Connect a 2" vent pipe, from water closet traps, and connect it to 4" soil pipe, 16" above the bath room floor. Vent the traps under bath tub and basin by 1½" lead pipe, with 3" lead pipe from water closet vent.

Safes.—Line under bath tub, water closet, and basin with 3 lb. sheet lead turned up 3" all around. Run a ¾" E lead pipe from the safes down to the cellar ceiling, and there left open for safe waste. Place a 3" brass strainer over every safe waste.

Water Closet.—Furnish and fit up one rapid stream washout water closet. Supply through a 1¼ C lead pipe. Supply to cistern through ½ AA lead pipe and ½" stop cock. Connect to main soil pipe.

Stop Cocks.—Furnish and connect necessary stop cocks.

Circulation Pipes.—Connect at bottom of boiler a ½" AA lead pipe, and run up to connect with hot water pipes in bath room for a circulation pipe. Place in one ⅝" compression bib at bottom of boiler for sediment cock.

Heater.—Furnish and fit up in cellar one of Boynton Furnace Co.'s No. 114 brick-set furnaces, with heater pipes, registers, and dampers complete.

Heater Pipes.—One 10 inch pipe to hall; one 10 inch pipe to parlor; one 9 inch pipe to dining room; one 9 inch pipe to library, and pipes and heaters to other rooms as required.

Range.—Furnish and fit up in kitchen one No. 80 Newport, eight inch holes, with lower hot closets and canopy, ventilator, shelf register, water back, and couplings complete.

Tubs.—Furnish and fit up three tubs, one to be single and one double cement tubs. Large size with stands to cost $19.50.

Wash Bowls.—Two Italian marble wash bowls, 30 × 22, with oval bowls, complete, with hot and cold water, with double combination faucets. Connect the water to the furnace to feed water pan or bowl. Provide one of Southworth's "Celebrated" grease traps, with iron ladle attached.

The Luminous Bacillus.

Before the Physiological Society, Berlin, Dr. Hermes recently showed the luminous bacillus brought some time ago with marine fish from the West Indian Ocean, and bred in pure cultures. In nutrient gelatine the bacillus formed funnel-shaped cultures at the surface. Inoculated into sterilized fish, it rendered them luminous to a very high degree. The bacillus developed also in fresh water fish, but only when these were placed in salt water. In fresh water the bacillus disappeared. At temperatures below 25° Celsius, the luminosity ceased. It was easy with this fish bacillus to render a large quantity of sea water luminous. If, however, the water were allowed to stand for twenty-four hours, only the surface was luminous; but by stirring it up, the whole mass again became luminous in consequence of the interpenetration of the air.

THE aroma of red cedar is fatal to house moths; the aroma of black walnut leaves is fatal to fleas. It is a matter of common observation that persons engaged in the business of making shingles from odoriferous cypress timber in malarial districts are rarely, if ever, affected by malarial diseases, and that persons engaged in distilling turpentine do not suffer from malarial diseases or consumption. It is said that when cholera was epidemic in Memphis, Tenn, persons working in livery stables were entirely exempt from it. It is affirmed that since the destruction of clove trees on the island of Ternate, the colony has suffered from epidemics unknown before; and in times when cholera had prevailed in London and Paris, those employed in the perfumery factories have escaped its ravages.

Real Estate Title Insurance.

Real Estate Title Insurance is an important factor which has been recently introduced into real estate transactions, assuring property owners of the validity of their titles beyond question or dispute; and is a substitute for the present expensive and tedious system of examination of titles, affording to the parties insured complete security against loss.

This relief and protection to purchasers or mortgagees of real property is to be found in an absolute insurance of title, by a sound and permanent corporation, with a large cash capital, standing ready to make good any insured title found defective from whatever cause.

The German-American Real Estate Title Guarantee Company, No. 34 Nassau St., New York, has been organized pursuant to Chap. 538 of the New York State laws of 1885, with a capital of $500,000, placed by statute under the supervision of the Superintendent of the Insurance Department of the State of New York, and will, upon the proper application, examine titles to real estate, and issue a policy of insurance which shall afford absolute protection to the purchaser, his heirs and devisees, and to the lender upon bond and mortgage, against all loss from defective title.

The company for its own protection will examine the titles it insures in a most thorough manner, by experts in its employ and by means of records and a plan of its own, and will then *guarantee its work.*

It will defend all actions brought against holders of its policies by reason of defects in the title insured, at its own expense, and will pay all losses to the extent of the policy issued.

If after an examination of the title the company refuse to issue a policy upon it, no fee is charged for the examination.

The usual fee of the company for the examination and guarantee in New York is $50 and disbursements, with an additional $5 on each $1,000 in excess of $5,000. In Brooklyn it is $30 and disbursements, with an additional $5 on each $1,000 in excess of $3,000.

Special rates for building operations, auction sales, and titles involving $50,000 or more.

The payment of a small fee permits a transfer of the guarantee with the deeds, in case of sale of mortgage.

Reissues to subsequent purchasers or mortgagees within five years, at one-third original fee.

If the title, when examined, is rejected by the company, no charge is made except for actual disbursements.

The law directs that the company, before it issues a policy, shall set apart a sum not less than two-thirds of the amount of its capital stock as a guarantee fund, to be invested as the statute provides, and to be applied only for the security and payment of losses incurred by reason of guarantees issued. A solid foundation for business is thus insured.

This system accomplishes the following:

1. *Security.*—It is the only system that affords absolute protection against defective titles.

2. *Saving of Time.*—The company proposes, by means of its superior facilities and the employment of a number of skilled lawyers, engaged exclusively in the searching of titles, to pass upon them with promptness. A property, the title to which has once been guaranteed, can be transferred within a very short time after application is made; and institutions, estates, and individuals holding mortgages upon such property can convert them into cash at once, instead of consuming from twenty to thirty days, as is now required, in having the titles researched upon each transfer.

3. *Saving of Money.*—It is proposed to guarantee the title, in the first instance, for a less sum than must now be paid to have the same title searched by a competent attorney; thus additional security is obtained, as well as time saved, at less cost.

After the title has once been searched and guaranteed, the property may be transferred, or a mortgage upon it assigned, and a similar guarantee obtained by the purchaser for one-third of the sum paid for the first guarantee.

4. *Ease of Transfer.*—A guaranty policy will enable an owner of a piece of property to convert it into money within a day or two, or obtain in the same time a loan upon it, on bond and mortgage; and will thus make real estate as available for collateral as stocks and bonds. This will serve to increase the demand for real property. Thus, briefly outlined, the new system offers absolute security from loss, saving in expense of conveyancing, charges fixed and known before the work is begun, special safeguards for mortgagees, and expedition in the transaction of business

The officers of the company are:

President, Andrew L. Soulard; *Vice-President*, Charles Hauselt; *Secretary*, Adolph Koppel; *Treasurer*, William Wagner; *Counsel*, Charles Unangst.

The directors are:

Charles Hauselt, John A. Beyer, A. J. D. Wedemeyer, George W. Quintard, Charles F. Tag, George C. Clausen, William Wagner, James Fellows, John Straiton, Jacob F. Miller, Adolph Koppel, Charles Unangst, Andrew L. Soulard.

The Summit Color Works.

It is evident that an architecturally beautiful house may be rendered unsightly by the use of inharmonious and gaudy paints, and it is equally evident that the most commonplace structure may be made attractive by the judicious selection and application of appropriate colors. Fortunately, the individual who is devoid of taste in this direction is generally aware of the fact, and therefore relies, for the ornamentation of his house at least, upon some one more artistically inclined. But instances are only too common of buildings covered with colors that seem to be at war with each other, and the casual observer feels a deep seated disgust for the owner and a sincere pity for the neighbors who are compelled to live in close proximity to the eyesore, especially when he remembers that the case might easily have been reversed had the owner possessed common sense enough to have placed the ornamentation of his dwelling in other hands.

This difficulty of selecting colors that will blend well, so as to produce the most pleasing effects, has been recognized by the well known firm of Chas. M. Childs & Co., of 225 Pearl street, this city, who have adopted an admirable method for presenting their pure ready mixed paints to builders and property owners who may not have the facilities for selection found in the large cities. Upon their specimen card they display the best and latest styles of colors, arranged in combinations of three each; and each combination shows the body, trimming, and blinds. The card before us contains twenty-seven colors, forming nine combinations, the upper color of each of which is the body, just beneath which is the trimming, with the blinds at the bottom. It is not an easy task, even for one having some experience, to select from the colors now so much in demand those which will appear well when spread over large surfaces, as the use of a wrong shade may destroy the intended general effect of the whole work. But by means of this card the various colors can be studied to the best advantage, and an accurate estimate formed regarding the effect to be produced when applied to any building. As the combinations were arranged by one of the best decorators in the country, the colors may be relied upon to blend well and be in harmony with each other, and to produce tasteful and pleasing effects. Although the user is, of course, free to make such other combinations as he may think best, he may rest assured that if he employs either of those presented, he will obtain attractive results.

It is apparent that this method of presenting colors will not only be appreciated by those who may be said to be "color blind" regarding the harmonious blending of shades, but will also be welcomed by the professional builder and architect, to whom it will prove to be of much assistance.

Scattered here and there throughout the country are a few who, through ignorance or design, cheapen or water their materials. The paint they use looks well enough when fresh, or until the job is complete; but it soon begins to present a weather beaten and dilapidated appearance. There are also owners—landlords—who have the notion that a cheap and inferior paint will last "long enough," and that it is more economical to cover frequently with poor material than it is to pay a little more at first, and get the best. Both of these classes ignore the fact that good paint to start with is, in the end, the cheapest. It would be to the decided advantage of some house owners to try the experiment of using a superior quality of paint, and ascertain for themselves if the difference in the first cost is not more than compensated for by the durability of the paint and the better general appearance of the house.

These paints are made only of material carefully selected, and of the purest quality. The greatest care and skill are exercised in their preparation, and they are guaranteed to be equal in all respects to any manufactured. They are presented in packages of various sizes, from a barrel of fifty gallons down to as small a quantity as one quart, and are also put up in cans containing from one to ten pounds.

The Messrs. Childs & Co. also prepare white paint for inside and outside work, and will at all times make any shade desired, when ordered in quantities of five gallons or over. This is an important consideration, and one that will be well received by builders, since it practically places at their disposal all the skill, experience, material, and machinery of an extensive paint works, and enables them to experiment with new colors at a moderate expense, and to order new shades of their own selection, with the certainty that their instructions will be faithfully followed.

It would be well for those contemplating building or painting this spring to send for one of these cards, even if for no other purpose than to have specimens of the shades that will be widely used. Further information concerning these paints, prices, etc., may be obtained by addressing Messrs. Childs & Co., as above.

THE total production of pig iron in the United States in 1886 was 6,366,688 net tons. This includes 47,982 net tons of spiegeleisen. The unsold stock of pig iron on hand on the last of December was 249,504 net tons.

Floors and Ceilings: Ancient and Modern.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

I.

In this series of articles the writer will endeavor to present a graphic account of the floors, floor coverings, and ceilings of the world. It would be interesting and profitable to visit the homes of the cave dwellers of India, the lake dwellers of Europe and the mound builders of America, but we should be obliged to invade the domain of regions still unexplored, and about which our knowledge is still in a formative state. We shall feel it a necessity, in some instances, to visit the huts of primitive man in many countries, but we shall not pause to discuss the archæology of remains of civilizations, but shall try to confine ourselves to races of men that are now living, or of whom we have positive information. We shall begin our journey in the land of the rising sun, and shall make the tour of the world, following the sun in its path to its setting in the golden gate of "the new world, which is the old." We shall visit Japan, Corea, China, Farther India, India, Siberia, Africa, the countries of Europe and America. In our wanderings, we shall try to enter the hut of the savage, the home of the working class, the buildings of state, and the palaces of potentates. Some of the buildings that we are privileged to enter we shall describe and illustrate, from both an æsthetic and technical point of view, and where it is possible, we shall give a technical description of floor construction, and the manufacture of fabrics that cover the floors. We shall try to point out the art and science of such construction, whenever it is possible to obtain such information. Our data have been collated from authentic sources, chiefly from travelers who have been eyewitnesses and observers of what we shall attempt to describe. We shall begin with "Mother Earth," the floor of primitive man in all ages, and conclude with the earthen floors which have been metamorphosed by heat and the arts of man, and to which we have given the generic title of tiling. Where man in his primitive state has found it necessary to provide his habitation with some kind of a floor, his instinct for want of definite knowledge has prompted him to make use of clay, as the best mineral substance adapted to his purpose, and the researches of the most learned modern scientists have so far been unable to discover any better material, although the treatment of it has been widely different. The primitive man has added sufficient water to the clay to make a stiff paste and spread it over the surface, kneading it with his feet, or ramming it with sticks or stones until it has become compact. The wind and sun complete his work by making the floor as hard as stone. The man of the nineteenth century has simply selected his material from the resources of the earth's crust, ground them to a fine powder, studied the properties of their elements, learned their chemical affinities and relations, studied the precise conditions his work must fulfill; his art has triumphed over nature, and he has been able to produce the marvelous mosaics and encaustic and encaustic art tiles which meet us in every building of note of modern times. From the first floor to the last floor, are many gaps in the records of locality and time, but we shall endeavor to trace the connection between the two, and in the endeavor we shall go from empire to kingdom, from principality to state, and from earliest historic time up to the present day.

We shall begin our journey with a brief description of the country itself. The name Japan, pronounced in the native language Nipon, is of Chinese origin, in the Mandarin dialect Jih-pun, that is sun source or eastern country. The celebrated Venetian, Marco Polo, was the first European to write an account of the country and its people. His work was written in 1298, in the Latin language. The Japanese chronicles go back of this date many centuries. The empire lies in the northwestern part of the Pacific Ocean, and consists of four large islands and a great number of small ones. It is separated on the west from Corea by a strait, which is about one hundred miles wide. At its northwestern extremity is the island of Tisima, or the "Thousand Islands," and at the north is the island of Krafto, or Saghalien, formerly a part of the empire, but now owned by Russia. The largest of the islands which make up the empire is Nipon, and it contains about 95,000 square miles; the next in size is Yesso, having an area of 30,000 square miles; then Kinsin, 16,000 square miles; and last, Sikok, with 10,000 square miles. The total length of the empire is 1,600 miles, and its greatest breadth is 200 miles. In all it numbers 3,850 islands. Its total area is 148,456 square miles. It is slightly larger than Montana, and only 644 square miles smaller than Dakota.

THE ART OF JAPAN.

From the wonderful works in ivory, lacquer, metal, embroidery, enamel pottery, and color work which have come to us from time to time, from the glowing accounts of travelers who have spent many years of study and research in that remarkable group of islands, we may well concede to Japan, of all oriental countries, the most pre-eminent position in all matters connected with the decorative and ornamental arts. In a number of branches of art manufacture, it is without a peer in the civilized world. Mr. Audsley well says that the peculiar habits and simple modes of life of the Japanese have not favored the general production of what may be considered important works of art.

Their tastes and industry have expended themselves in the formation, in an artistic form or with elaborate ornamentation, of countless articles of utility, articles of every day use, suitable for all classes of people. Beyond a few small cabinets, tiers of shelves, low stands, trays, and similar objects, they have no household furniture. Mats cover the floors, and on these they sit during the day and sleep at night. Japanese houses are divided into apartments at will by sliding screens, formed of wood frames, covered with paper, patterned or painted with landscapes, flowers, and birds.

Folding screens, either painted or embroidered, are also used. Special works of art in the shape of pictures, *kakemono*, or hanging pictures, are hung up on certain occasions, and help to relieve the extreme simplicity of the apartments. The most talented Japanese artists have produced many of their best drawings in the shape of kakemono.

According to Mr. Audsley and other writers of note, it is a fact worthy of notice that many of the most talented artists which Japan has produced have been satisfied to labor in the humble fields of art industry; and painters and designers of repute have not thought it beneath their dignity to display their manipulative skill and the wealth of their imagination in the adornments of common objects of daily use.

Honest workmanship is a leading characteristic in all branches of Japanese ornamental art. There is a greatness about such loving honesty which cannot be overestimated, and its influence is stamped upon every genuine art work which has been produced in Japan.

According to Louis Gonse, the architectural art of Japan has two dominant qualities; first, its intimate association with the character of the landscape which makes its *mise en scene*, and its decoration. This, though, in two senses, is more in the structure itself than in the brilliancy of the Japanese genius. That minuteness of finish which we admire in such a small type as a lacquered box, or in what may be an unimportant and common object, will be found equally carried out in the ornamentation of a temple. In it all, and through it all, we see the same good faith in execution, the same fidelity to the main conception. No matter how minute the details, the same regard is exhibited and the work is executed with like scrupulosity. In his luxurious work Mr. Gonse has likened them to the master workmen of the thirteenth century, who judged of the beauty of their work by its complication, and declares that it is nothing if not indigenous to their solicitude. The Japanese have a marvelous understanding of how to express exquisite elegance with moderation. His summary of the household appointments does not differ in any particulars from what we have related. He remarks that it is only when the proprietor of the house is a man of taste that the kakemono carries the signature of the master, and the screen becomes a veritable work of art.

(*To be continued.*)

Incendiary Birds.

To the Editor of the Scientific American:

I write to relate an incident which may be of interest to some of the readers of your valuable paper. There is a bar iron mill, situated in a neighboring town four miles from here, that has been on fire three or four times, in which the English sparrow might be called the incendiary. These sparrows pick up old pieces of cotton waste, which they build in their nests, among the timbers of the roof of the mill, and in every case of the fires above mentioned, these nests were the cause, either from spontaneous combustion or from sparks from the hot iron striking and lodging in the nest. If you could suggest some way of getting rid of the sparrows, I think the manager of the mill would be glad to adopt your plan. R. W. KEAR.

Pottsville, Pa., February 14, 1887.

PATENTS.

Messrs. Munn & Co., in connection with the publication of the **Scientific American,** continue to examine improvements and to act as Solicitors of Patents for Inventors.

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MUNN & CO., Solicitors of Patents, 361 Broadway, New York.

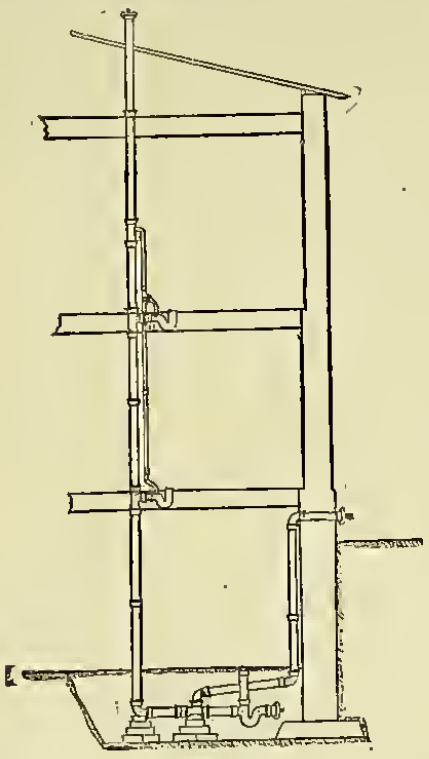
BRANCH OFFICE.—622 F Street, Washington, D. C.

AN ENTRANCE PORCH.

Our illustration, from *The Builder*, is a sketch of the entrance porch of Dutton Hall, one of the famous old English homes. The curious and ornamental construction here so well blended affords a good subject for study.

TESTS OF PLUMBING IN MINNEAPOLIS.

This cut represents a section of a two story and basement house, with the plumbing ready for inspection.



The stack is complete from top to, and including, the running trap and fresh air inlet. The traps for water closets and wastes for wash bowls, bath, and kitchen sink, are all calked in, the traps wiped on to wastes, pinched together at the top, and soldered up. A piece of heavy sheet lead is soldered on top of the water closet traps; the ventilation pipes are connected with the crowns of traps; the soil pipe is sealed at top and bottom, and the fresh air inlet is left to attach the proving apparatus. We have the whole system of plumbing under test; whereas, if only the soil pipe were tested, there are yet three joints to make for every fixture, which will never be under proper test. While it is not practicable in all cases to connect the traps as soon as the soil pipe is roughed in, owing to the unfinished state of the carpenter work, yet, as a rule, water closet traps, lead bends, and a short piece of waste pipe can generally be calked in when the roughing-in is done. Then if it stands the test, there is little danger from open joints in the balance of the work. However, when it is possible, the whole system of plumbing should be under test at the same time. Ten pounds of compressed air to the square inch, on a complete job, is a fair test. If the work stands under that pressure, it will, as a rule, stand fifteen pounds or more. Good workmen have no trouble in making their work absolutely air tight, with extra heavy soil pipe. The greatest danger is in calking around brass ferrules, and great care should be taken lest they "buckle in."

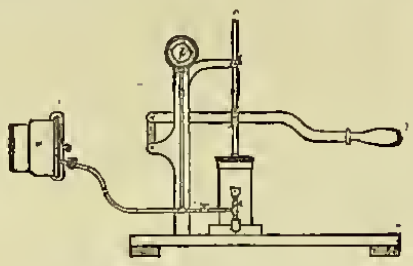
The other cut represents a testing apparatus recently devised (not patented) by Plumbing Inspector Hazen, and as any mechanic can construct one, we take pleasure in presenting it to our readers. It has been in use in this city about two months, and gives entire satisfaction to plumbers, architects, and owners. Its ability to make a thorough test, together with its simplicity, commends it at once.

To test a job of plumbing with the proving apparatus, it is necessary to have a two or four inch iron plug with rubber gasket to fit on the shoulder of the pipe in the hub F, held in place by a clamp over the end of the hub, with a set screw in the center to screw down on the plug. Into one side of this plug, screw in a short nipple and cock, G, to attach a hose from the pump; close cock, D, and open cock, E; work the pump until the gauge, C, shows five pounds pressure, then close cock, E. If the work is absolutely tight, the indicator will remain at five pounds; if defective, the indicator will go down. Now unscrew cap of ether cup, B; open cock, D, and let the pressure off from the pipe; close cock, D; put one ounce of ether in the cup; screw on cap; open cock, D, to let the ether down, and at the same time begin to work the pump; close cock, D; pump up to five pounds pressure, and close cock, E. The ether will indicate where the leaks are, which the plumber will at once calk tight. Test the work again at ten pounds pressure, and if the indicator stands at that, the work is absolutely tight.

To test the pump, put on ten pounds pressure, close cocks, G and E, and if the indicator stands, the pump is tight.

A little soap and water put on the leaky joints with a brush will show the exact location of a leak, by the formation of bubbles.

For good sanitary plumbing, a strict observance of



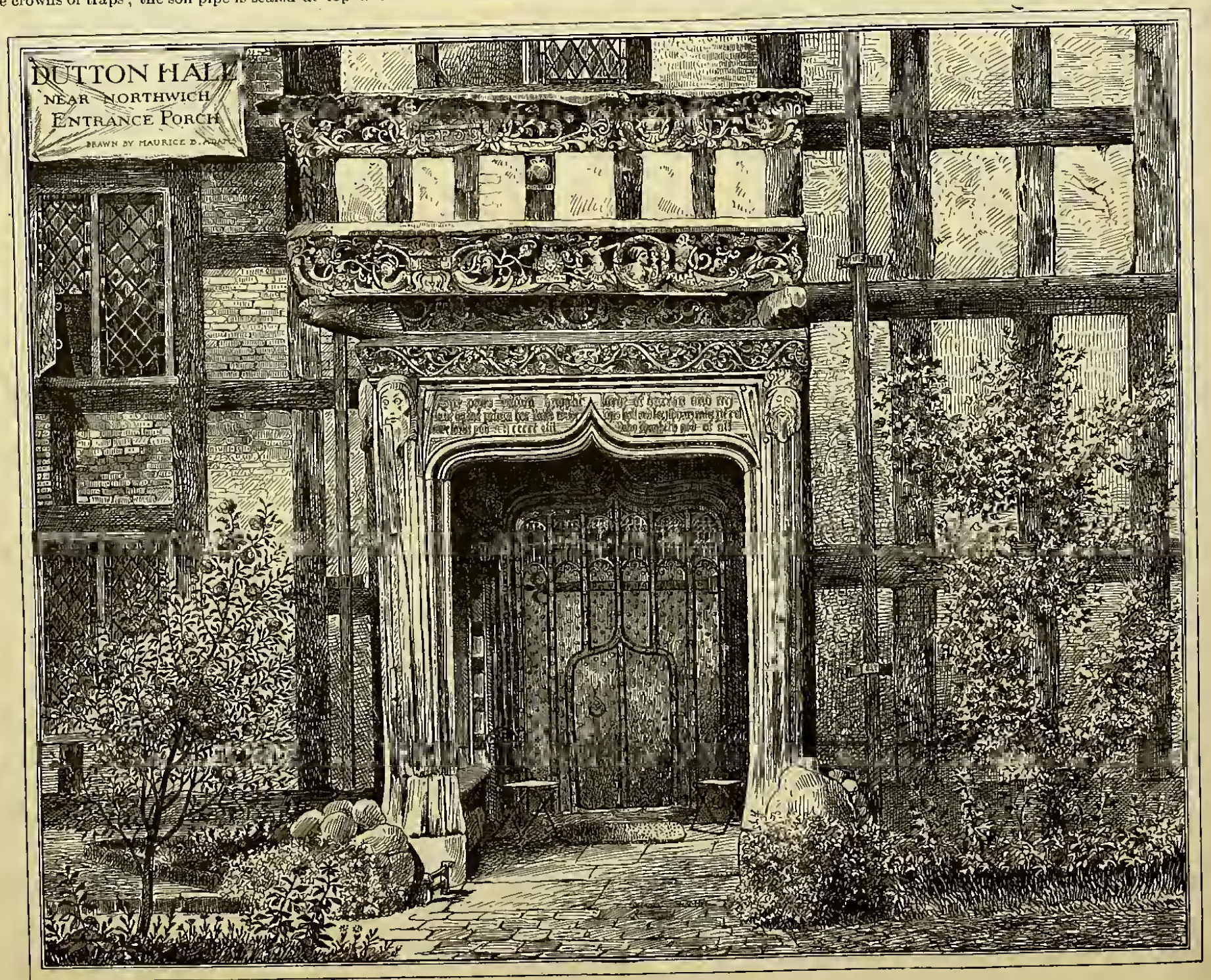
INSPECTOR HAZEN'S PUMP.

the city ordinances by the plumbers, and thorough examination and inspection, Minneapolis is second to no other city in the Union.—*N. W. Architect.*

A Telegraph Lantern.

The Oatman signal telegraph lantern is intended for military and naval use. This lantern is of a convenient size, strong and simple in construction, and can easily be carried around. A blowpipe flame is used, which so intensifies the light that it resembles an electric light, and can be easily seen with the naked eye for 10½ miles, and with a glass for 15 miles. The messages are exchanged by the Continental code or Morse system, the dot being signified by a quick flash and the dash by a flash of longer duration. Ordinary mineral oil is used, and the light will burn for about five hours with the one filling. Rain or wind has no effect on it.

In a letter of indorsement from the Chief Signal Officer, War Department, to whom lanterns were given for trial, it is stated that messages were exchanged between Sugar Loaf and Camp Biddle, a distance of 20 miles. A board of officers appointed by the Navy Department to examine the lantern also attest its value.



AN ENTRANCE PORCH.

MINERAL WOOL AS A FILLING.

The necessity for using non-conducting substances as filling material between floors, partitions, side walls, and roofs is now very generally recognized and practiced by architects and builders. Of the various substances proposed for this purpose, probably the best, regarded in all aspects, is the article now widely known in the trade as *mineral wool*. This substance is, in fact, nothing more nor less than a species of glass, drawn out by a peculiar process into the form of fine threads, which are curled up into innumerable convolutions, and hence the name *mineral wool*.

It will at once be apparent from the enduring nature of its composition that it is admirably adapted for the purpose mentioned. It is now very extensively employed, and its use is becoming quite general. We give herewith an engraving of an ordinary dwelling house, with parts broken out to illustrate how the *mineral wool* is applied and used, between the floors, in the roofing, the side walls and the partitions. Now the objects of these fillings may be stated as follows:

As to Heat and Cold.—A filling of *mineral wool* in the ground floor, say two inches thick, protects against the dampness of cellar. In the outside walls, from foundation to peak, between the studding, it will prevent the extraction of the warmth of interior, and will destroy the force of winds which otherwise will penetrate and cause draughts. In the roof, say two inches thick, it will retain the heat which rises through stair wells, bringing about regularity of temperature in cold weather. The upper rooms will not receive the heat of the summer sun and store it up for the occupants during the night, but remain as cool as those on the floor below. The water fixtures in bath rooms, closets, and pantries will not be exposed to extremes of heat and cold.

As to Sound.—As sound is communicated by the actual contact of beams, and also by the vibration of the air between them, it can well be understood how a porous material like *mineral wool* will have a muffling influence on the solid parts of a building, and so occupy the space that wave motions will not be possible. Such a lining is especially desirable about bath rooms to deaden noise of valves and flowing water.

As to Rats, Mice, Insects, and Disease Germs.—The analysis of *mineral wool* shows it to be a silicate of magnesia, lime, alumina, potash, and soda. The slag wool contains also some sulphur compounds. It is plain there is nothing organic in the stuff to decay or to furnish food and comfort to insects and vermin. On the other hand, the fine fibers of glass are irritating to anything which attempts to burrow in them. We feel confident in saying that new houses lined with *mineral wool* will not become infested with animal life, and old walls may be ridden of their tenants by the introduction of it.

All earths, mortars, felts, and sheathing papers contain organic matter, such as hair and vegetable fiber, which, after a time, undergo decomposition and create a variety of disease germs. The dangers to health arising from the presence of these sources of infection are greatly aggravated by the continued filtering of dust particles and water through cracks. To leave the floor spaces empty would not avoid contamination in this way, except such parts are open to thorough ventilation, otherwise they would simply form a refuge for a mixed population.

As to Fire.—An incombustible material like *mineral wool* renders a building slow burning. We do not claim that it will be *fire-proof*, for that is impossible so long as inflammable stuff is used in construction. In passages occupied by the *mineral wool* flames cannot spread. Thus surely will they be exposed to sight, and an opportunity for quenching them be offered at the outset. It hinders the spread of fire, and thus gives time for *escape for the inmates, thus serving better than ladders.*

Spontaneous combustion sometimes takes place when the floor beams, for instance, have been dried until the point of ignition is very low, and when in conjunction with this the freely circulating air is charged with moisture. With these two conditions fulfilled, it only needs the fanning action of a draught to start combustion. Such a coincidence of conditions cannot be brought about if the spaces between beams are filled with indestructible mineral wool.

In all its uses *mineral wool* must be held in position by retaining walls, which should be sealed tight to keep the finer particles from sifting out. The house should be closed in, so that the material may not become wet, and the wall filled from the inside. The job should be done at the same time that the laths are being put on. Apply by the handful, and only press into place so that it fills the spaces completely. Do not jam or push roughly with sticks. Being applied *dry*, the other work is not delayed at all, and there is no possibility of dampness. Once in place, it remains intact until the retaining walls are removed. The presence of *mineral wool* behind the lath does not prevent the plaster *keying*. It is pliable, and gives way readily to the pressure.

If the owner of a house is thinking of insulating it by *back plastering*, or deadening it with *mortar*, or making it free from vermin by a filling of *shavings*, or rendering it incombustible by sheathing the air spaces with *tarred paper*, he is fortunate in having but one object to gain, and but one way of accomplishing it. It is obvious that to ask the cost of this vitreous substance as compared with that of the usual devices is not pertinent, because it substitutes them all, while none of the others serves more than *one specific purpose.*

A car load of ordinary slag wool containing 1,400 cubic feet will answer to fill 4,200 square feet 4 inches thick or 8,400 square feet 2 inches thick. The approximate cost will be $200. The value of such a quantity must be in its affording comfort, besides securing economy in heating and insurance.

Mineral wool is invaluable in hospitals and asylums on account of its arresting the spread of fire, not to mention its other properties. Equally important applications can be made with it in public and private schools, music and concert rooms, sounding boards, hotels, cottages, country residences, charitable institutions, and in deadening the flats of apartment houses, and insulating the outside walls of conservatories, hen and pigeon houses.

Mineral wool is made by converting vitreous or scoriaceous substances into a fibrous state. The slag of blast furnaces affords a large supply of material suitable for this purpose. The product thus obtained is known as *slag wool*. For the reason that slags are seldom free from compounds of sulphur, which are objectionable in the fiber, and in order to be independent of the action of furnaces, we prepare a cinder from which we make *rock wool*. These two products comprise the two kinds of *mineral wool*. They are not to be distinguished from it, but from each other.

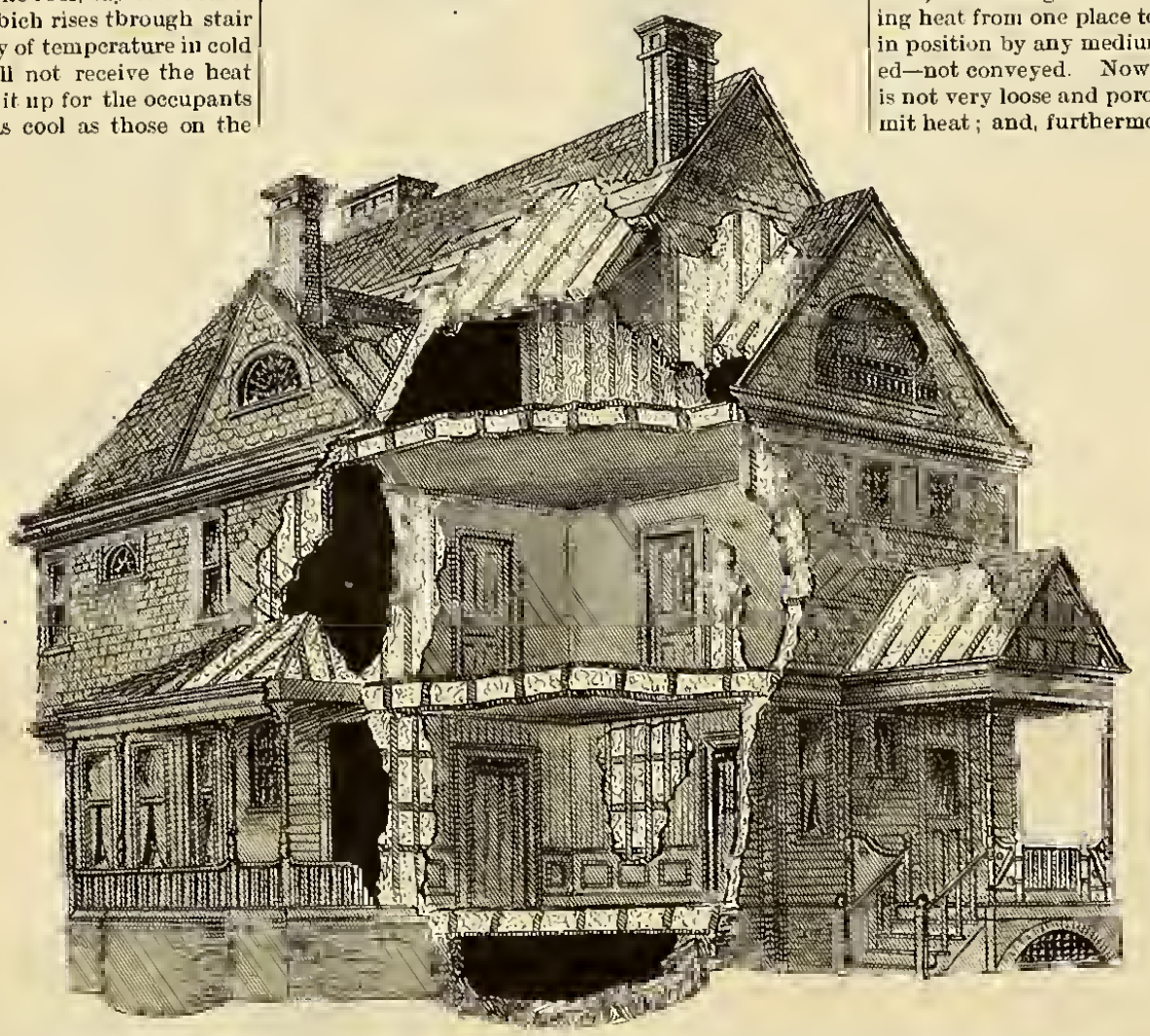
The grades of *mineral wool*, *extra* and *ordinary*, are based upon difference in weight and quality. There is no distinction in composition. The ordinary grade contains the coarser fibers intermingled with a few shot, which it is not possible to shake out entirely.

Air is so subtile and rapid in movement when unconfined, and so slow to convey heat, except by its own motion, that it is at once the very best distributor of heat and also the greatest barrier to its transmission, according as it has or has not freedom to circulate. It is not a matter of surprise that this apparently anomalous state of things is misleading and constantly giving rise to popular errors. That the dimensions of what is called an air space are entirely arbitrary, no one will deny. It may have a volume of one cubic foot, or it may be the smallest unit of volume into which air is divisible. We are disposed to classify the first case under *climatology*, and the second under *insulation*; for so long as air may circulate at all, it is conveying heat from one place to another, while if it is held in position by any medium, the heat must be conducted—not conveyed. Now, if the air-confining material is not very loose and porous, it will be found to transmit heat; and, furthermore, the reduction of the percentage of volume of air, by making the material more compact, develops its capacity for conducting heat. Therefore, so far as theory goes, the poorest conductor of heat is the material which contains the largest percentage of volume of air. Any other view of it is at variance with science and the many illustrations found in nature.

We find that 192 pounds, or *one cubic foot*, of slag make 192 pounds, or *ten cubic feet*, of ordinary mineral wool, so that the resulting fibers incase nine cubic feet of air. In other words, the cubic foot, before conversion, contained 100 per cent. of material, and after conversion only 10 per cent.; therefore the product must contain 90 per cent. of its volume of air. In same way the *extra* grade is found to have 95 per cent. of its volume of air in it, and, consequently, it is a poorer conductor than the *ordinary*. It is certain that this proportion of air is not incased by any other product, natural or artificial, which is, at the same time, indestructible.

The transmission of sound is prevented by a filling of *mineral wool*, because of its slight elasticity and want of solidity. This is a very important feature, because no other material in general use for heat-proofing and fire-proofing possesses also the property of sound-proofing. A fourth advantage, which is of equal value with the others, is the irritation which the glass fibers cause both to insects and vermin. There is nothing in its composition which can help to breed or harbor insects, and no animal life will remain in it.

Further information can be obtained respecting the advantages and uses of this excellent material by addressing the United States Mineral Wool Co., 22 Cortlandt Street, New York.



FLOORS, ROOFS, PARTITIONS, AND SIDE WALLS FILLED WITH MINERAL WOOL

Mexican Windows.

Mexicans seem to entertain the idea that windows were made to look in at as well as to look out of, and it is a matter of daily occurrence for men, women, and children of the *gamin* order, including peddlers and professional beggars, to congregate outside the bars and stand calmly staring in at us by the hour. The first sight of these barred windows strikes the stranger in Mexico rather unpleasantly, and he is apt to fancy himself in prison behind them, with his iron bedstead and brick floor for suitable accessories. In time, however, he realizes not only the conveniences but the necessity of them, and by and by feels an uneasy sense of insecurity if by some rare chance he finds himself not thus protected. The greater portion of Mexico is a land of perpetual summer, where windows must be open both night and day, and these gratings cannot be "picked" like locks, or noiselessly cut like panes of glass. But though one may sleep here in perfect security without closing a shutter, it is well to move one's effects from proximity to the windows, for the *ladrones* have a habit of throwing in ropes with hooks attached and dexterously drawing out even your garments—from which practice, perhaps, originated the Texan slang word "hooking," for stealing. It is only justice to add that there is far less thieving going on in Mexico, in proportion to population, than in our own country, for the influence of Roman Catholicism is paramount, especially among the poorer classes. I venture to assert that with all your spring bolts and careful precautions to bring in even the door mats at nightfall, there is more stealing done in any Northern city in a single day than in all Mexico in a year's time. —*Phil. Record.*

THE LEWIS GRATE AND OPEN FIREPLACE.

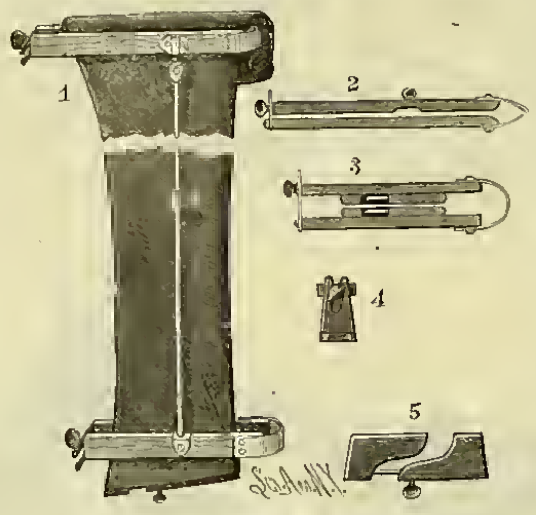
The advantages possessed by the grate herewith illustrated, when compared with the old style, are so strikingly evident as to need but a brief description. The heat and products of combustion pass from the fire in the basket, A, under the hood, B, down the flues or columns, CC, into the hollow base, D, and thence back under the grate to the main flue or chimney. The course is clearly indicated by the arrows in the sectional view. The back fire wall, I, is composed of four pieces, the upper one being of corrugated iron so arranged as to receive the lower half of back and two side pieces, which are of fire tiling 2¾ inches thick, thus making a smooth, firm, and durable back. If thought desirable, the back wall can be built altogether of fire tiling. The door, E, in the front of the hollow base is for the purpose of removing all accumulations of soot and ashes that fall down the chimney. It is also provided with a register to check the draught after the fire has burned to a bed of coals, thereby retaining the heat. The chimney walls are represented at HH. As the heat is retained in the fire chamber by the hood, B, a more perfect combustion is created, and the heat is thrown out into the apartment instead of passing up the chimney, as in the grates now in use.

The following claims are presented for this grate over others: A more perfect draught; to give double the heat with the same amount of fuel; to heat a room in one-third of the time; no soot can possibly fall down the chimney to injure rugs, carpets, etc; while poking the fire, no ashes will fly over the room, covering everything on the mantel and surroundings; no possible danger of flues catching fire, and endangering life and property; no need of stopping up flue or taking out basket during the warm season; it is ever ready to build a fire on cold, damp days in spring and fall. By having a water tank of from three to five gallons capacity placed on top of the hood, it is possible to have hot water in the room at all times during the winter season.

All further particulars concerning this grate, which is spoken of in the highest terms by those who have used it, can be obtained by addressing The Lewis Grate Co., of 316 West Sixth Street, Cincinnati, Ohio.

TROUSERS STRETCHER.

It is claimed for the trousers stretcher here illustrated that it is adjustable to any size of trousers; that



WESTON'S TROUSERS STRETCHER.

it will not form creases in them; and, by the use of adjustable forms inserted in their bottoms, it not only does not give an objectionable shape to them, but directly tends to restore their original shape. It is thoroughly effective in stretching the trousers as well. The upper part of the trousers is grasped by the clamp shown in Fig. 2, while the lower parts are held by the one shown in Fig. 3. Each clamp consists of two bars, united at one end by a bent spring, and provided at the other end with a slotted strap and screw (Fig. 4), by means of which the bars are held against the trousers. Within the bottom of each leg is placed a tree, Fig. 5, the bars of which can be adjusted by means of a rod and set screw so as to properly occupy the bottom portions of the pantaloons. The ends of the trees are inclined, as shown, so as to conform to the shape of the bottoms of the trousers. The use of trees is, of course, unnecessary with the upper clamp. The position of the clamps, when in use, is clearly indicated by the perspective view, Fig. 1. The forcing of the clamps away from each other, and the consequent stretching of the trousers, are effected by a simple telescopic connection, which also adapts the stretcher to trousers of different lengths. When the straps are released, the springs cause the bars to spring apart and thereby disengage the clamps from the trousers.

This invention has been patented by Mr. E. C. Weston, of 17 South Fortieth Street, Philadelphia, Pa., who will furnish particulars concerning the sale of the patent or manufacture on royalty.

Easy Water Tests.

1. *For Detecting Organic Matter in Water.*—To half a wineglassful of the water add about a dozen drops of a solution of *permanganate of potash* (Condy's fluid). This will give a *rose color* to the water. Let it stand for two hours. If the color changes to *dull yellow*, the water is unwholesome. If the color disappears, the water is positively dangerous.

2. *For Detecting Lead in Drinking Water.*—To half a wineglassful of the water add a dozen drops of a solution of *bicarbonate of potash*. If the water becomes dull or clouded, there is lead in it, and it is, therefore, injurious to health.

3. *For Detecting Carbonate of Lime in Water.*—To half a wineglassful of the water add twenty or thirty drops of a solution of *caustic lime*. Presently, the water will have a milky appearance if it contains carbonate of lime. Let it then stand for two or three hours, and there will be a white sediment.

4. *For Detecting Sulphate of Lime in Water.*—To half a wineglassful of the water add twenty to twenty-five drops of a solution of *nitrate of baryta*. A *milky* appearance afterward and a white precipitate will indicate the presence of sulphate of lime.

5. *For Detecting Ammonia in Water.*—To half a wineglassful of the water add twelve drops of a solution of *zinc*. There will be a *cloudy* or milky appearance if *ammonia* is present.

6. *For Detecting Iron in Water.*—To half a wineglassful of the water add a few drops of a solution of *prussiate of potash*. A *blue* color will be produced if *iron* is present.

7. *For Detecting Phosphates in Water.*—To half a wineglassful of the water add five or six drops of *ammonia*. A *white, cloudy* appearance will result if phosphates are present.

8. *For Detecting Sewage in Well Water.*—Pour some of the water to be examined into a very weak solution of *permanganate of potash* (Condy's fluid). It will be turned *green* or be bleached if *sewage* is present.

9. *A Negative Test for Determining whether Water can hold Lead in Solution.*—To half a wineglassful of the water add a few drops of a solution of *acetate of lead*. If a *cloudy or milky* appearance results, the water *cannot* hold *lead* in solution.—*Industrial Review.*

Hon. S. Hallett, F.R.G.S., referring to the great changes in every department of trade, commerce, manufactures, etc., in a lecture before the Society of Arts, London, said that in Great Britain fifty years ago, two-thirds of the working classes were engaged in agriculture, while now only one-fourth are thus employed.

Fig. 1.—FRONT VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

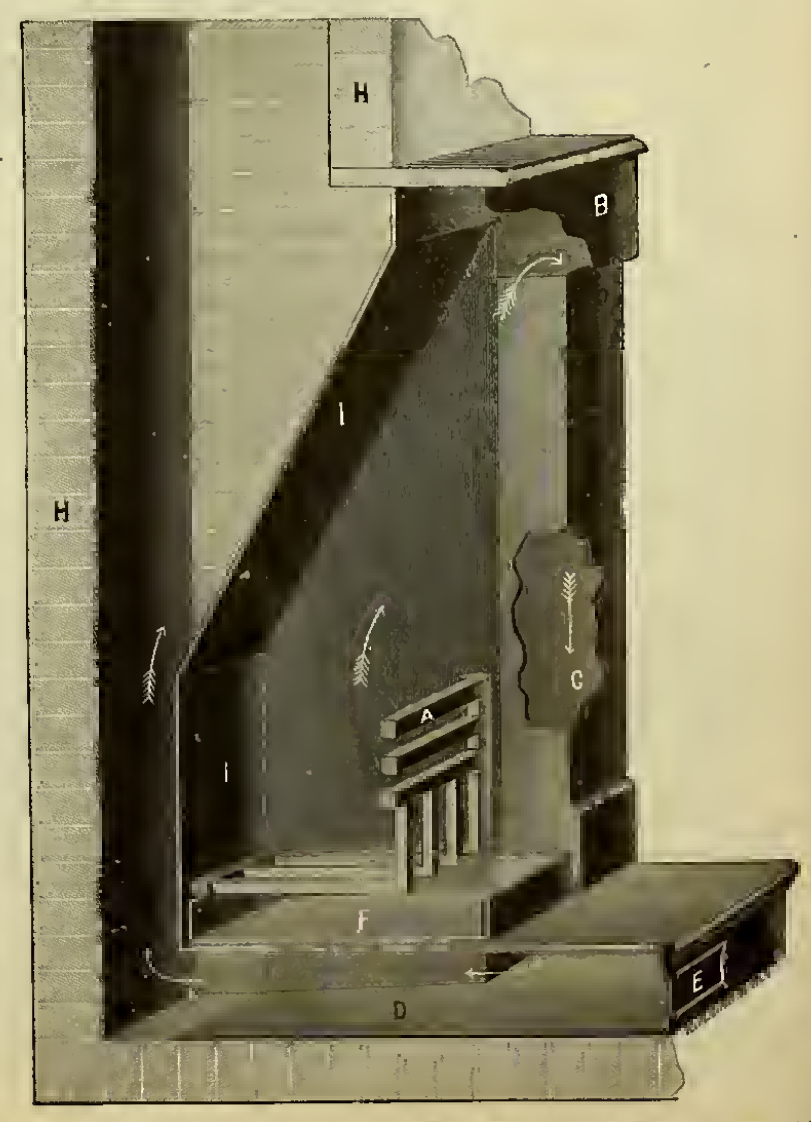


Fig. 2.—SECTIONAL VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

Plaster Work

Designs & Working Drawings.

Detail of Moulding in A

B

A

Wood Mouldings

Detail of Rosette in C

B

Combed and Stamped Cove on Wet Plaster

Queen Anne Motives

from Designs by E. L. Ayes

Detail of Leaf in B

D

Detail in D

Detail in E

E

Front & Side View of Brachet for D.

Section of Cornice

Cornice to go with D

Composite Motives.

Designed by B. Day

Scientific American N.Y.

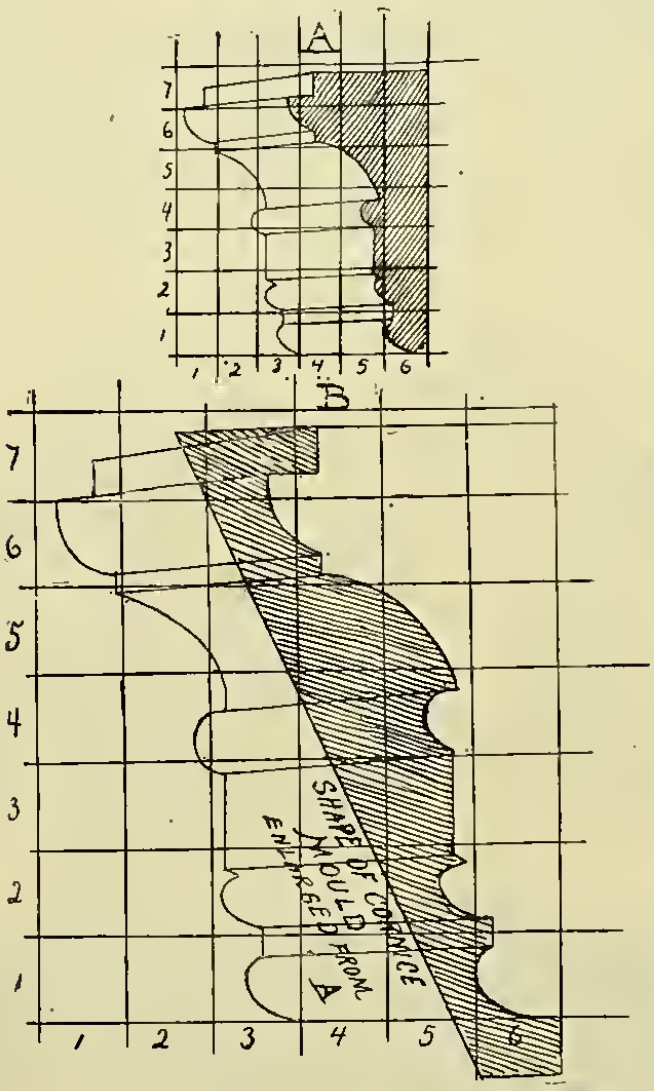
B. Day. Del 1886

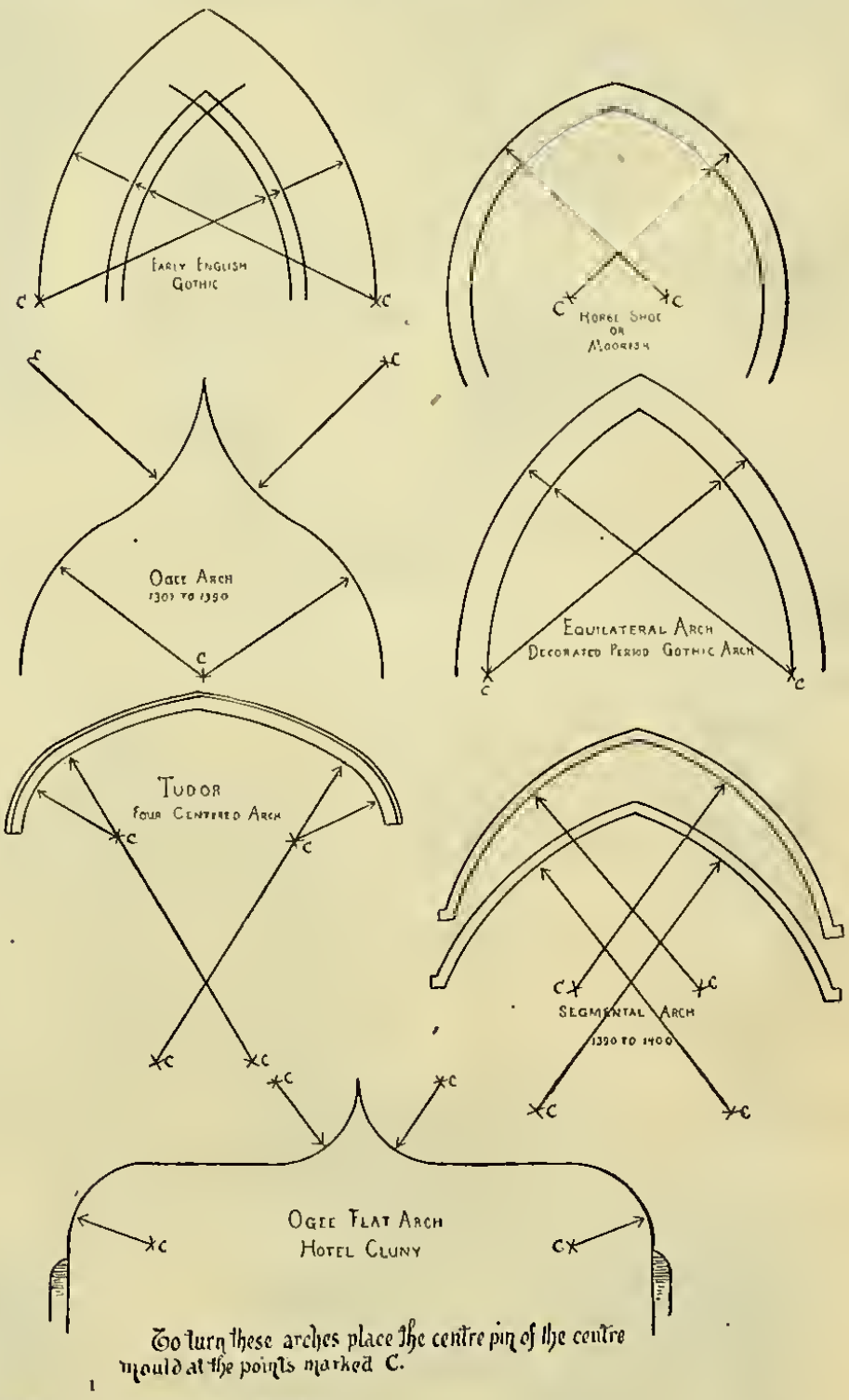
ORNAMENTAL PLASTER WORK.

The art of plastering is as old as the art of building, and yet, except in the case of expensive houses, built in or near large cities, its use is confined to the covering of flat surfaces and the running of plain cornices, very little thought being given to using its resources as a means of ornamentation. A suitably decorated ceiling, one in which the cornices have beautiful lines well proportioned to the size of the room, with an artistic center piece, is a source of never failing gratification when well conceived and artistically modeled. The reverse is true of a poor conception carried out in bad taste. The interior decorator should always bear in mind that his work is constantly before the eyes of his client, and, like the pictures on the wall, is criticised, not only by the owner, but by his friends. There is no reason why any intelligent plasterer should confine himself to flat surfaces, nor why he should not utilize his spare time in attempts at drawing, sculpture, modeling, etc. There are times of the year, when his trade is dull, which he could well employ in the study of decorative sculpture, and we propose to give him a hint how to get at it.

DRAWING

for this purpose is mostly linear or outline drawing. Any small design can be enlarged by means of the square, as shown in Figs. A and B. Make a series of squares on tracing paper that will cover the design to be copied, then divide the proposed size to which you wish to enlarge the design into a similar number of large squares, as shown in Fig. B. By numbering two sides, as shown in both diagrams, you can easily find the square you wish to copy and that portion of




Early English Gothic
Horse Shoe or Moorish
Ogee Arch 1301 to 1390
Equilateral Arch Decorated Period Gothic Arch
Tudor four Centered Arch
Segmental Arch 1390 to 1400
Ogee Flat Arch Hotel Cluny
To turn these arches place the centre pin of the centre mould at the points marked C.

ORNAMENTAL PLASTER WORK.

the design contained in such square. Copy each square until the whole design is enlarged. In the diagram, B, is also shown the manner of enlarging the shapes of cornice moulds from the designs thereof on page 75 of designs. The shaded portion represents the metal shape of the cornice mould. The outline is traced on the metal by cutting the shape out in paper and laying it or pasting it on the sheet metal of which the mould is formed.

This same method applies to designs from which you propose to model. Enlarge your design always before modeling it. It will help you greatly in its execution.

MODELING

is the shaping of any plastic material in forms either representing natural objects or combinations of beautiful shapes, termed ornaments. It is essentially a building process, and hence the reverse of sculpture, which consists in cutting away the material sculptured until the desired shape is obtained.

The mud pie and the snow man are the most primitive forms of modeling, and yet really indicate the very best method of procedure, which consists in building up the object to be modeled by the gradual addition of the plastic material to a base. The French, than whom no greater modern sculptors exist, do not cut away their clay or sculpt it, but build up their statues and designs by the gradual addition of small pellets of clay, which their fingers shape, while their eyes and minds seek the place to apply them. It is a fascinating sight to see an object take shape under the skillful manipulation of a good modeler, a sight that impels even the most timid to try their hand at it. The best part of the work is done by the thumb and fingers, and the most useful tools are those shaped like small thumbs. Of course, a variety of tools is necessary, especially in ornament. Their shapes vary from chisel shapes to small trowel shapes. The best way is to make or buy these tools as their need is felt, but, as in many other professions, the fewer the tools, the better the work.

Clay is the material most used for modeling. This can be puddled with water in a tub, allowed to settle for a day or two, then pour off the water, and use only the finer parts, which will be on the top layer, as the grit will settle at the bottom; but as it is cheap, it is perhaps less trouble to buy it already prepared. While modeling in clay, spray on water from time to time to keep the clay from cracking, but don't get it too wet. Always cover your work with wet cloths after your day's work, and if you lay it aside for a day or two, be sure and wet the cloths at least twice a day.

Wax is another material used for modeling. It requires no wetting to keep it in a plastic condition, like clay, but, being expensive, is not much used except for small work. Mr. Leonard Sence gives the following recipe for modeling wax:

Yellow wax	4 lb.
Canada balsam	1 "
White resin	1 "
Potato fecula	6 "
Four tallow candles.	

Melt the wax over a gentle fire, add gradually the balsam and resin and two of the candles, then gradually work in the potato fecula, and lastly the other two candles. Color with any finely ground innoxious pigment, such as jeweler's rouge, lamp black, indigo, etc. Lead or mercurial colors should be avoided, on account of their poisonous nature.

To cool, pour on a cold oiled marble slab, after which you work it up with your hands like dough, to get it in working condition.

The same modeling tools can be used for wax that are used for clay, the fingers of course playing the most prominent part in the work. Saliva is used on the most prominent part in the work. Saliva is used on the modeling tool, to prevent the tool from adhering to the wax, although glycerine will answer the same purpose.

In this article we have given you the required hints to enable you, if you have any notion of drawing or modeling, to make an attempt at it. In our next we will endeavor to explain the processes of moulding and casting in plaster, and we hope by that time you have something modeled that you may wish to cast.

Black Birch.

The price of black birch of the best quality has recently gone up from $7 to $95 per 1,000. The extraordinary advance is due to the discovery that boards cut out of the first logs are susceptible of a very high polish, and can be used for almost any purpose hitherto exclusively reserved for mahogany, which is worth about $250 a thousand. The advance has been expedited by the discovery that the best black walnut is giving out. Black walnut from Arkansas and the South is so porous that it is of very little use in furniture making. The best black birch is found almost exclusively on the barren copper ore regions between Milwaukee and Ashland, where all other timber is stunted in growth and very poor. Here boards cut of the butt cut quickly assume a beautiful red tint on being exposed to the atmosphere, and can be polished up to a great degree of fineness. The price will soon fall to $50 to $60 a thousand, as a railroad is being laid right through the very inaccessible region where it grows, and the high prices have tempted several men to open out saw mills. Red beech has also advanced in price very rapidly. It could be bought up recently in Indiana and Ohio for the bare cost of sawing, but now it is worth $30 a thousand.—*Lumberman's Gazette.*

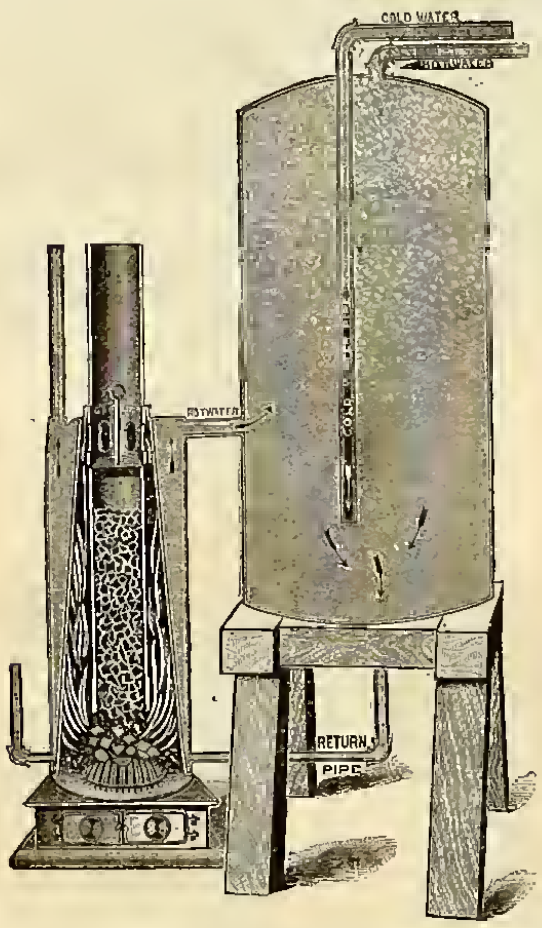
A COMBINED door plate, bell pull, and mail receiver has been patented by Mr. Michael A. McGlinn, of Lancaster, Pa. The plate has an oblong aperture corresponding with the mail-receiving aperture in the door, and a pivoted spring-actuated plate, which acts also to operate the door bell.

HOT WATER PLUMBING.

The agreeable heat which may be secured by a system of hot water, its cleanliness of operation and its noiselessness, are great items in its favor, and inquiries for systems of hot water heating are beginning to increase from clients to architects and from architects to plumbers and steam fitters.

The circulation of water is the cardinal principle in this system of heating. Plumbers are all thoroughly conversant with the fact that water may be made to circulate by the proper construction of the boiler and its accompanying pipes, but what many do not understand is that the laws which govern the circulation of heated water are so simple that any deviation from them in practice either prevents or greatly impedes the circulation. Hence it is often found by plumbers that, after great care has been taken to secure a proper construction of the system, the water will not circulate and they are unable to explain the cause. It will be the endeavor of the *Sanitary News* in this article to make these laws so plain that they may always be remembered.

The circulation of the water is caused by unequal pressure on some portion of the system. The most common system of heating water for circulation is that required in connection with the kitchen range by every modern city house. It is easily illustrated in the subjoined engraving of Wilke's circulating heater and hot water reservoir. The reason that the water circulates in this or any similar apparatus is that, when heat is applied to the water in the chamber



about the fire box, a dilation of the volume of the water takes place and it becomes lighter. The heated water rises in the chamber and finds its outlet through the short pipe leading to the boiler. The moment heat is received by the water and it becomes lighter, a change in the pressure occurs and the cold water, being heavier, begins to flow through the return pipe into the bottom of the water chamber in the heater, and this movement continues. If we suppose, for the time, that the circulating system includes nothing but the heater and the water reservoir, and that the two pipes attached to the top of the water reservoir are removed, we shall see that the hot water will flow into the reservoir and collect at the top, and the cooler and heavier water will gather at the bottom and flow down the return pipe to replace the water moving out at the top. There is nothing more simple than this movement. Persons not familar with the laws of hydrostatics might not see at a glance that the pressure would be even in this system before heat was applied, when they consider the great difference in size between the columns of water maintained in the water chamber in the heater and in the one inch return pipe. The pressure of fluids depends on the height of the column only, and is entirely irrespective of the bulk. Therefore, the one inch pipe exerts as much pressure as the much larger heating chamber.

If the pipes referred to were entirely disconnected, and the reservoir and return pipe allowed no heat to escape from the water, the circulation would take place until the water was of a uniform temperature, which would occur only when no more heat could be received from the fire, when the circulation would stop. This, however, would never occur in practical work, for the water is continually losing its heat by conduction and radiation, and a uniform degree of heat can never occur. The quicker the water loses its heat, the heavier it becomes and the more rapid the circulation becomes.

This brings us to the point where circulation of hot water throughout the house to different fixtures is desired. For this purpose, the pipes are carried from the crown of the reservoir, the hot water pipe always leading from the top of the reservoir, where the hottest water always is. The cold water supply pipe empties down in the lower part of the reservoir where the cool water is, to avoid reducing the temperature of the hot water by mixing cold with it.

It is evident, after the explanation of the pressure law of fluids, if the hot water pipe and the return pipe are carried to the same height in a building and there connected, that circulation will always result, as the pipes form a simple elongation of the two original columns of water.

In practical plumbing it is necessary to supply fixtures on different floors, and at different levels, and the question of securing a circulation becomes an important one.

The main flow pipe, after leaving the crown of the boiler, is carried horizontally to a point over the sink. Here a branch is dropped down to the level of the sink cock. The main flow pipe is then carried to the next floor, on which there are fixtures, by as direct and straight a route as possible. The pipe is led as near to the fixture as possible and a branch taken off to the cock. The main flow pipe then continues to the next floor, on which is the bath room, probably. The pipe is connected to the bath cock by as short a branch as possible, and is then carried around the side of the bath tub to the wash basin. These generally complete the fixtures to which hot water is conducted; to complete the circulation, the main flow pipe is continued directly back, without any branches, to a point underneath the boiler, where it connects with the return pipe leading from the boiler to the fire back. This system, if properly constructed, will form a circulating system which will work satisfactorily.

For convenience, the cold water pipe is constructed parallel with the hot water pipe, but it has no return pipe, and comes to a dead end at the highest fixture.

It is frequently noticed that upon opening the hot-water faucet a large amount of cold water is expelled before the hot water begins to flow. This need not necessarily be so, and if it occurs, can be remedied. It is caused by leading a long branch from the circulating system, instead of so placing the circulating pipes that a very short branch would be necessary to reach the hot water faucet.

Another annoying feature in some hot water systems is the belching of air from the hot water fixtures on the upper floor. This is because the plumber has neglected to supply an air vent at the highest point on the system. Vapor is always present in water. As it becomes heated, the air is expelled from the water and collects at the highest part of the system. Here a cock is usually placed to allow its escape. In case the water pressure in the house is from a tank, the air vent may be left permanently open, if it extends above the level of the cistern.

The pressure exerted in the hot water system of a house is principally exerted on the boiler. If the pipe leading from it is 34½ feet long from the bottom of the boiler, and is full of water, the bursting pressure on every square inch of the inner surface of the boiler will be fifteen pounds. The requirement for boilers of a good tested strength is very apparent.

In this apparatus, where hot water is continually being drawn off and is replaced by cold, there will be a greater or less deposit of mineral matter, according to the degree of hardness of the water. This is provided for to some extent by the sediment cock at the bottom of the boiler; yet the pipe which runs through the fire back is often stopped up with lime. In some localities, notably Sioux City, Ia., this deposit is very extensive, constantly requiring the substitution of new connections.

Another source of trouble with fire backs is in their freezing in severe weather. It is impossible to prevent it in houses which will not withstand the inroads of cold, except by keeping fire in the stove all night. Drawing off the water at night is futile, because it necessitates looking out for air binds; and if there is a dip, even of slight extent, in any portion of the system, it is impossible to empty the system of water, and it is liable to freeze, and to require the whole plumbing to be torn out to find the stoppage. If there is a suspicion that the water back is frozen, it is best to burn a newspaper or two under the connecting pipes. If water exposed about the room is frozen, it would be desirable to do this any way. If the lead pipe is slightly bent, the cracking of the ice inside will determine if it is frozen. If, after the fire has been burning a few minutes, the upper pipe does not feel warmer than the lower, the supposition that the pipes are frozen will be always correct.

There is one cause for the non-circulation of water in pipes which plumbers should be constantly alive to. It is that the most trivial obstruction, such as a lead shaving lodged in the pipe, in a tank system where the pressure is not aided by the pressure from the mains, may entirely prevent the circulation. This is because the motive power of the heat upon the water is so small. It is so small that an ounce, or even a fraction of an ounce, often expresses it. This small amount of motive power is easily overcome.

The velocity of the circulation is another point in which plumbers are interested. As the movement of the water is dependent upon the difference in temperature of the water in the rising pipe and in the return pipe, it is evident that any measure to maintain the temperature in the hot water pipe, such as packing, etc., and to reduce the temperature in the return pipe, such as doubling it back and forth horizontally, thus increasing its length, and increasing the amount of heat lost by radiation, will increase the velocity of the circulation, and deliver the water to distant fixtures at a higher temperature than otherwise would be the case.—*Sanitary News.*

SIMPLE METHOD OF LAYING OUT THE JOINTS IN ELLIPTICAL VAULTS.

Mr. Maurice d'Ocagne points out in the *Annales des Ponts et Chaussees* the following simple method of drawing the outlines of the joints in elliptical vaults:

Let $M_1, M_2, M_3, \ldots M_7$ (Fig. 1), be the points of

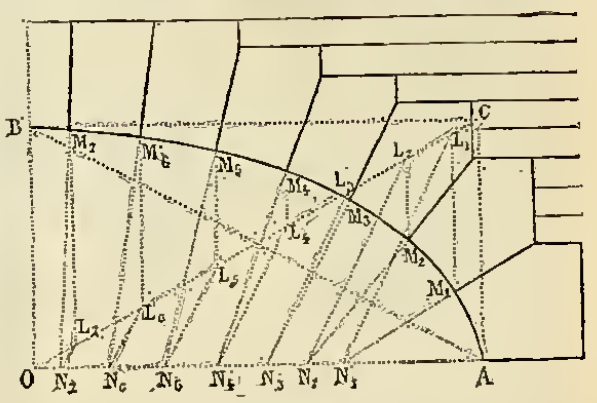


Fig. 1.

the quarter ellipse, A B, through which it is a question of outlining the joints, that is to say, the perpendiculars to the ellipse.

As the tangents at the summits, A and B, intersect each other at C, let us draw the straight lines, A B and O C.

The perpendiculars to O A, extended through the points, $M_1, M_2, M_3, \ldots M_7$, will intersect the straight line, O C, at the points, $L_1, L_2, L_3, \ldots L_7$.

The perpendiculars to A B, extended through the points, $L_1, L_2, L_3, \ldots L_7$, will intersect the axis, O A, at the points, $N_1, N_2, N_3, \ldots N_7$. The straight lines, $M_1 N_1$, $M_2 N_2$, $M_3 N_3$, $\ldots M_7 N_7$, are the perpendiculars sought.

In fact, let M N (Fig. 2) be the perpendicular to the

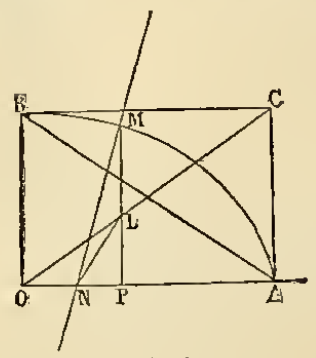


Fig. 2.

ellipse at the point, M. From the point, N, suppose we let fall upon the line, A B, the perpendicular, N L, which intersects the ordinate, M P, at the point, L.

Then, by virtue of a well known property of the ellipse, we have

$$\frac{PN}{OP} = \frac{b^2}{a^2}$$

As the triangles, P L N and O A B, have sides that are perpendicular to each other, we have also

$$\frac{PL}{PN} = \frac{a}{b}$$

Upon multiplying these equalities, member by member, we obtain

$$\frac{PL}{OP} = \frac{b}{a}$$

an equality that shows that the point, L, is situated on the straight line, O C, *quod erat demonstrandum.*

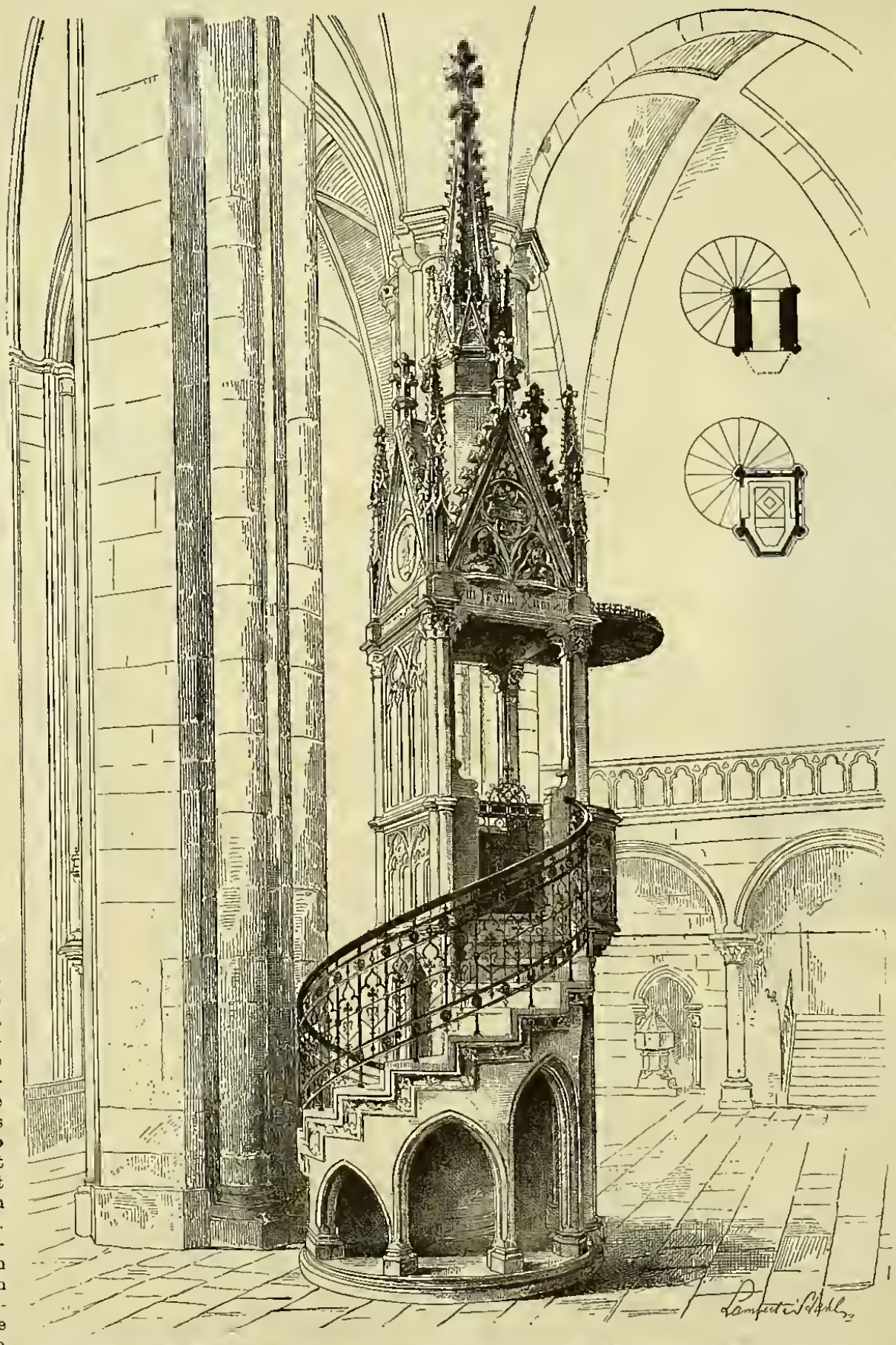
A House Designed for Future Enlargement.

We give with this number a colored plate of a house designed for future enlargement. It is complete in itself; but at some future time, when prosperity comes to the proprietor or his family increases, he may need to enlarge and extend his homestead. With our next number, May, we intend to illustrate the same house and show its plans and appearance when enlarged.

A GOTHIC PULPIT.

The architects had to solve the problem of building a stone pulpit worthy of the time-honored Church of the Holy Cross on a comparatively small space. For this reason they deviated from the ordinary design, and obtained the desired breadth by the balcony-like broadening of the platform. The platform of the old pulpit was about eight feet above the floor of the church, and the beginning of the staircase was in the massive foundation.

The center of the pulpit has a breadth of 4 feet, and it is 35 feet high, while the radius of the staircase is 4 feet. The foundation and the cluster of pillars is made of "Grisignano," and the back wall and the baldachin of "Savoniere" stone. The variegated sounding board is of wood. The dimensions of the latter are moderate, in accordance with the design, but it answers its purpose perfectly. The entire cost is about $4,600.—*Architektonische Rundschau.*



PULPIT, CHURCH OF THE HOLY CROSS, LOWER AUSTRIA.—AVANS & LANGE, ARCHITECTS, VIENNA.

Hints on Building.

Put up the frame and get a roof over it as soon as may be, say in May or earlier. Then let it stand until the first of September to season. This is the old fashioned way, and it has advantages which those who have had experience with shrinking timber will not be slow to appreciate. In this part of the country the timber for a frame is always green when it is put up. Indeed, hemlock could not be worked very well dry. It is much better to have the shrinkage done before the inside finish is on than after.

All floors should be double. A layer of sheathing paper between them would not be a bad idea, and would pay for itself. The upper floor ought to go down after the mason work is done. A smooth, nice floor is a great preserver of carpets.

Back of the wash boards the space should be filled in with bricks. The ends of the floor timbers ought to be filled in such a way as to prevent rats and mice from having a free passage. Such a filling greatly diminishes the danger from fire.

Do not let the tinman or the contractor persuade you that the gutters should be left until red with rust before they are painted. It is a plan which is designed to benefit them exclusively. The paint goes on more easily after the red rust begins. The tin, however, has begun its own destruction, and will go on rusting under the paint just as steadily as though it had no protection, though perhaps not quite so fast. Tin roofs should not be allowed to get red. They can be cleaned and painted on one side in the shop. The objection to this is that the resin or acid (none of the latter should be used) needs to becleaned off by the rains, so that the paint will stick. The best plan is to have the cleaning done at once, without waiting for the rain.

All piping should be put into the house while it is in the frame. This saves expense and much cutting of woodwork. Alongside each chimney it is a good plan to have a space extending from floor to floor in which pipes can be run if desired. The chimney breasts and the spaces which they cover ought to be plastered on wire lath, for safety, and thus avoid shrinkage.

Have a spare flue in each chimney, to be used for ventilation. The open fireplace, as a ventilator, however, is a delusion. Make openings into the flue at the base board, and by proper management of doors and windows, perfectly pure air can be secured in every room.

Heat by a big hot air furnace several sizes larger than the furnace makers recommend. This furnishes the means for perfect ventilation, by providing an ample supply of warm, pure air. Keep the pipes and registers perfectly clean, or the smell of cooked dust will be mistaken for that bugaboo "burnt air."

In plastering do not use a "brown coat" of mortar. Put the finish directly on the "scratch coat." Time, labor, and patience will be saved, and the work will be better, harder, and more durable. Build the foundations for the piers, in the cellar, with as much care and deeper than those of the external walls. These piers support the center of the house, and they are frequently neglected. The result is a great crop of cracks in the plaster.

Have the walls of the upper floor 9 feet high in the clear, even if you have to cut off six inches from the floor below. This is of course for a moderate size of house. High ceilings for sleeping rooms tend toward giving the sleepers purer air by furnishing greater space. When one is drawing plans, it is best to consult with a carpenter and see whether the framing will come out even multiples of commercial lengths. It is sometimes cheaper to use the full lengths of the timber than to cut off six inches from the ends. Increasing the size of a house six or eight inches may frequently be done without any appreciable addition to the cost.

In designing, get the inside arrangement right. Have places for every piece of furniture. Arrange the bedrooms so that they will contain beds without putting them against doors or windows. Put them against inside walls if possible. Have some connecting rooms and some which do not. After all this is done, put the outside on. Let doors and windows come where they will, and do not spoil your own comfort for the sake of an external appearance which is for the benefit of your neighbors.

Lastly, have a garret by building a sharp roof. Cover the roof with dark colored slate from Maine or Vermont. Lay it in cement, and be happy.

Moral: Alterations on paper cost much less than those in wood and stone. Therefore it is better to spend a long time over the plans than to make changes on which the builder charges his own price.—*The Mechanical News.*

A STONE AND BRICK COTTAGE.

This house, which belongs to Mr. J. N. D'Andrea, is built on the Basque principle, under one roof, with covered balconies on the south side, the north side being kept low to give the sun an opportunity of shining in winter on the house and greenhouse adjacent, as well as to assist in the more picturesque grouping of the two. On this side is placed, approached by porch and lobby, the hall with a fireplace of the "olden time," lavatory, etc., butler's pantry, water closet, staircase, larder, kitchen, scullery, stores, etc.

On the south side are two sitting rooms, opening into a conservatory. There are six bed rooms, a dining room, bath room, and housemaid's sink.

The walls are built of colored wall stones, known as "insides," and half timbered brickwork, covered with the Portland cement stucco, finished Parian, and painted a cream color.

All the interior woodwork is of selected pitch pine, the hall being boarded throughout. Colored lead-light glass is introduced in the upper parts of the windows in every room, etc.

The architect is Mr. W. A. Herbert Martin, of Bradford, England.—*Architect.*

Slate Roofs.

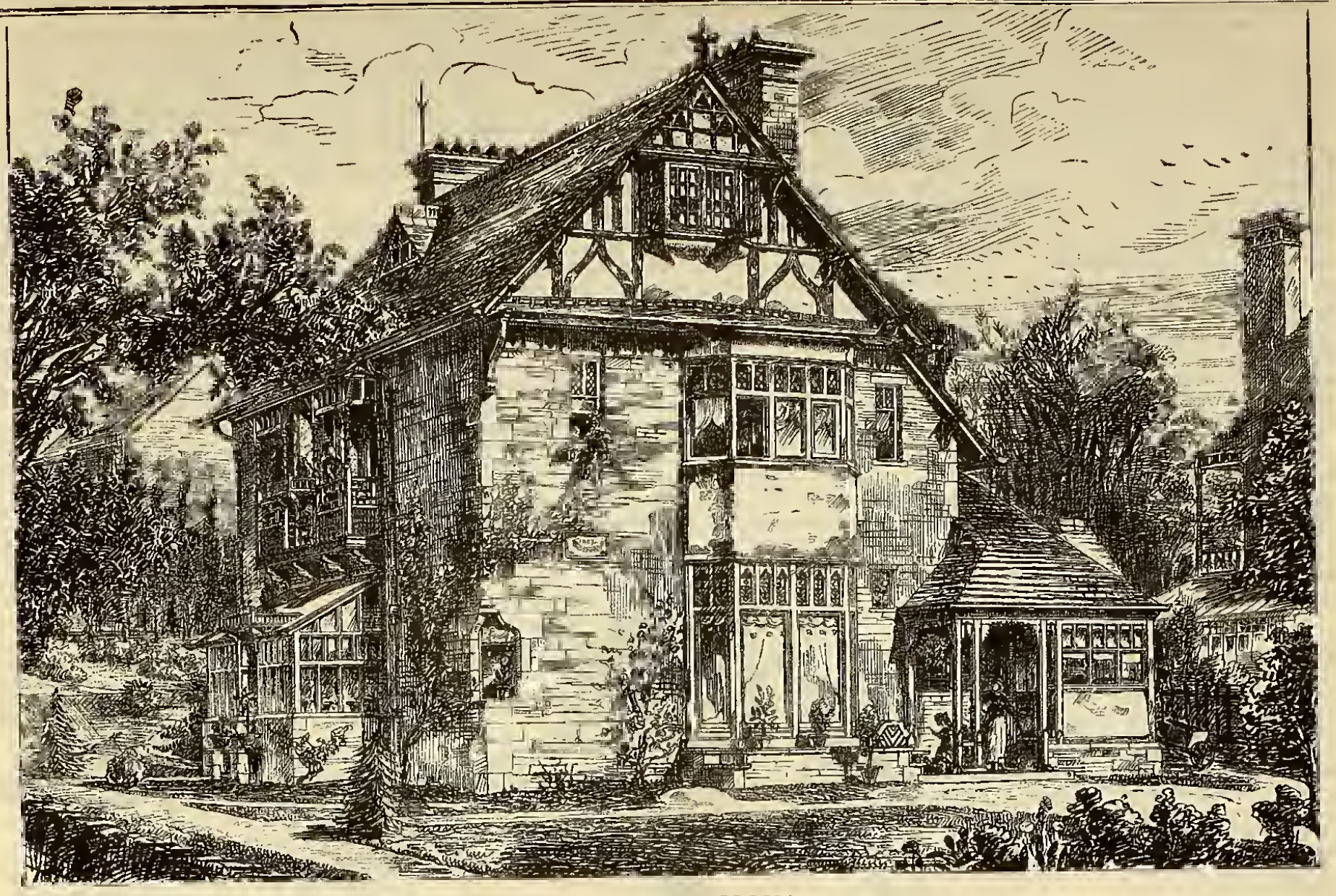
C. C B., of Jackson, Mich., wishes to know (1) of any way to fix a slate roof so it will not leak, or (2) of any paint or preparation that a roof can be covered over with, to prevent the water from working back up under the slate.

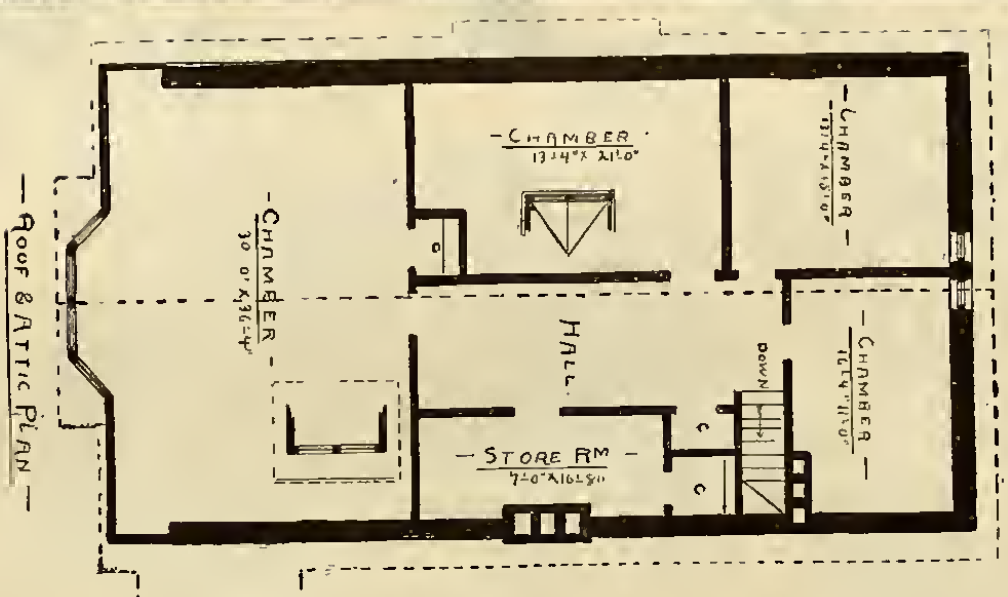
(1) When slates are laid upon a board roof, the boards should be covered with waterproof bituminized felting, overlapping on the incline of the roof. If upon battens, a sheet wire netting can be stretched from batten to batten to keep the felt from sagging, and the slates laid with the proper tilt to make the tails lie close.

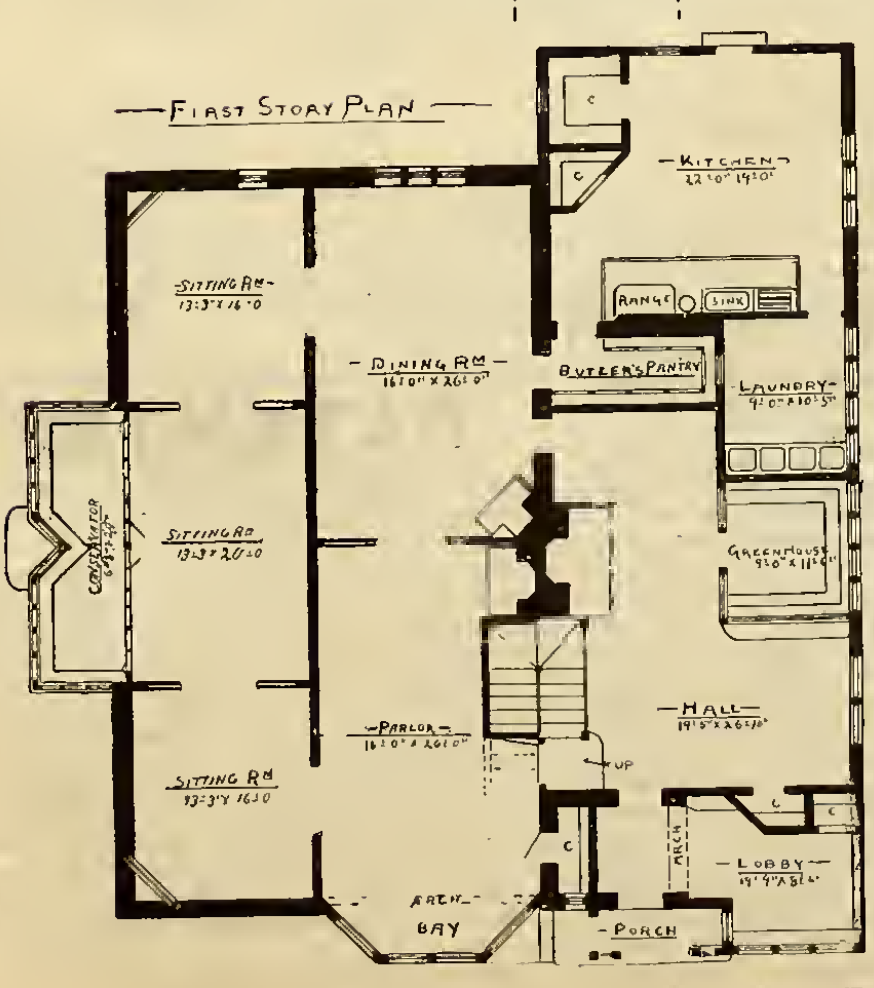
(2) To keep out draughts, as well as a special precaution against leakage occurring on exposed sites from driving rain or melting snow, the slates are often pointed with hair mortar on the inside, or *torched*, as it is termed; or they may be shouldered or bedded for about two inches at their heads in hair mortar, generally mixed with coal ashes, *which have been sifted and washed*, to give a good slate color, and this method is more effectual than mere pointing, as it does not get loose nor drop out, while it tends to keep the *tails* or *feet* of the slates down tight.

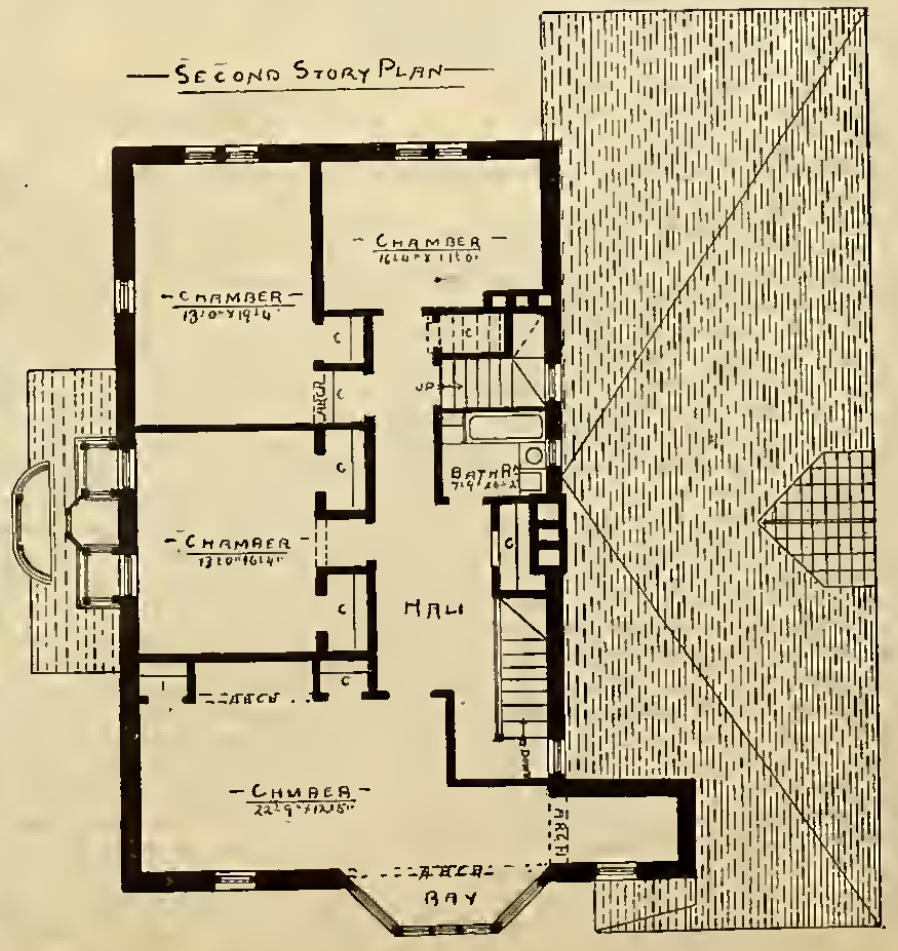
Sometimes the slates are rendered on the under sides with hair mortar, both to keep out the weather and maintain a more equable temperature within.

If the slates are already laid, pointing must be resorted to as suggested, but there is a cement for pointing which has been in successful operation in this country and England for a long time, and it is superior to hair mortar. It is this: Take equal parts of whiting and dry sand, and 25 per cent of litharge, made into the consistency of putty with linseed oil. Use just enough sifted and washed coal ashes, in addition, to give the mixture a good slate color. It is not liable to crack when cold, nor melt like coal tar and asphalt with the heat of the sun.









A STONE AND BRICK COTTAGE.

Redwood Logging in California.

The whole world concedes to America pre-eminence in the size of her trees available for timber. In no part of the world are trees to be found equaling in size the forest monarchs of California, save in certain parts of Australia and Tasmania, where the eucalyptus trees grow, perhaps, to equal dimensions, but the wood of the encalyptus is gnarled and worthless, twisting and warping if used. California's big trees are of two varieties, the Sequoia gigantea, the most celebrated examples of which are found in the vicinity of the Yosemite, and the Sequoia sempervirens, or redwood, which, through extending from the vicinity of Santa Barbara on the south to Oregon on the north, are found in greatest size in Humboldt County. In the early English works on phytography, it was sought to link the name of their great Wellington to the trees of the Yosemite, but now it is agreed that to the father of the American nation this honor appropriately belongs, and the name of Washingtonia gigantea is now coming into favor in popular and scientific usage.

In the forests of Norway, Sweden, and Finland, the great timber-producing countries of northern Europe, the standard width of boards is 6 inches, and trees larger than 8 to 10 in. diameter are unusual. Several years ago a large American locomotive establishment shipped a cargo of locomotives to Hangho, the terminus of one of the Finnish railways. They were packed in boxes of Michigan two inch pine plank, many of them 15 in. to 18 in. or more in width. Boards of this extraordinary width attracted much attention, and an employe of the railway obtained sufficient of the empty boxes and fashioned them into a house—the best in the place—and people came in considerable numbers to marvel at trees which could produce boards like those The thrifty housewives greatly prized pieces of the same boards for making moulding boards, and many were distributed for this purpose. If our ordinary lumber of commerce could excite such surprise, how much greater the astonishment and admiration of the same people at California's wonders!

An American gentleman was once waiting at a Russian custom house to have his effects examined and passed. As he opened his trunk a photograph of one of the great trees was lying on top exposed to view. The inspector examined it eagerly. "Ah," said he, "that is from California. I have a brother there who has written us at home much about them, but we could not credit it. I have never seen a photograph of them."

The picture was presented to him, whereupon work was suspended until it had been handed about and discussed by all, up to the chief of the custom house. The photograph showed a great tree partially cut for felling, with twelve persons sitting uncrowded in the V-shaped cutting. This calls to mind a *bon mot* of the late George Whitney, of Philadelphia, who, on seeing the same photograph, exclaimed, "Why, it is a photograph, but it really looks like a wood-cut!"

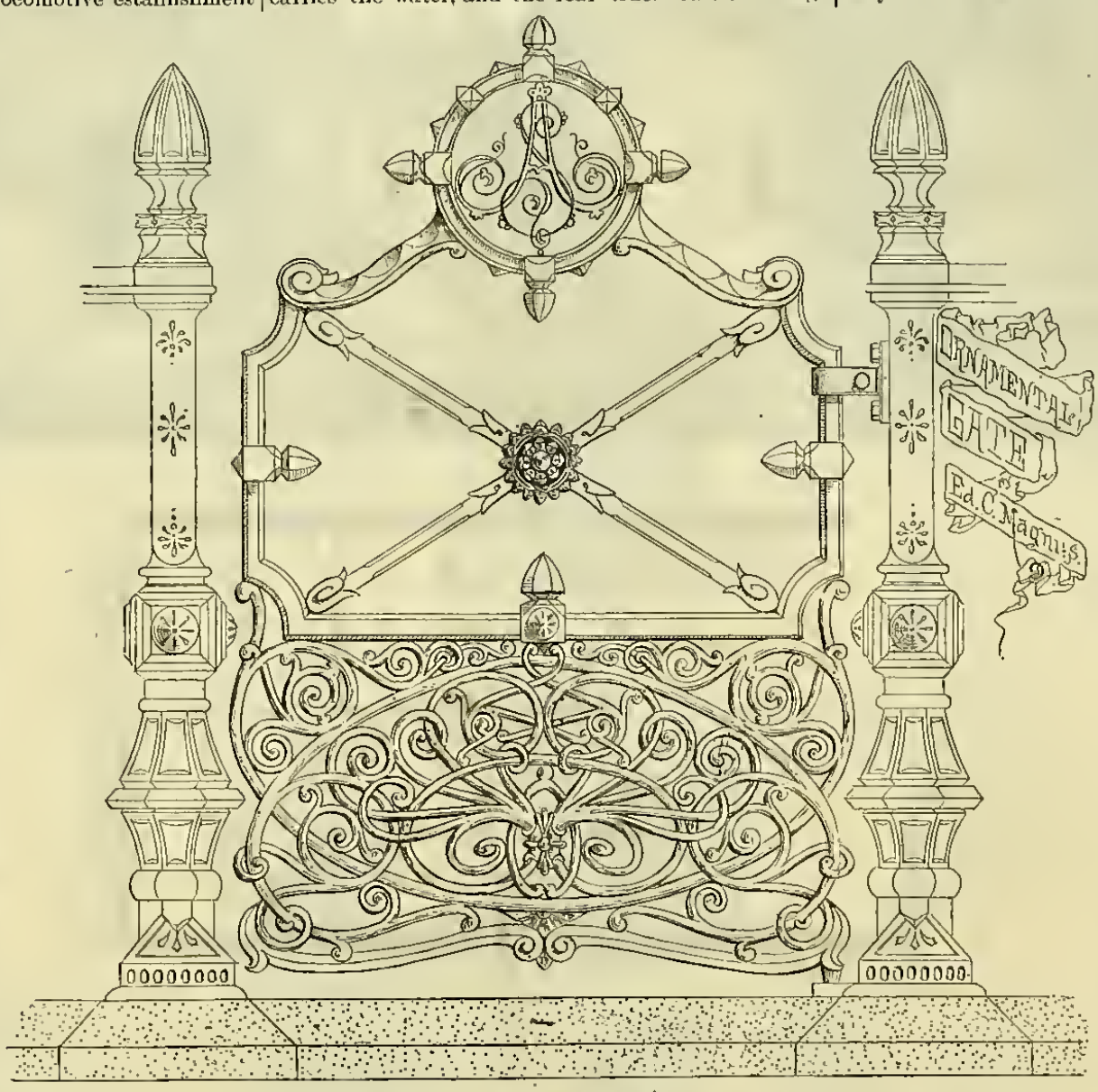
A peculiarity of the redwood forests is the absence of undergrowth. It is, therefore, difficult to realize their magnitude without a familiar object near by with which to compare them. Until one begins to make such a comparison the trees do not appear of extraordinary size. Like the cataract of Niagara, the first view is frequently disappointing, and familiarity, far from breeding contempt, serves to increase the feeling of awe inspired by overpowering magnitude.

In consequence of the great size of the redwood, the process of getting the logs to the mills has been a slow and expensive one. Floating has been impracticable, owing both to the size and the weight of the logs, even where there are streams. Hence, logging railroads are in California a necessity, instead of an economic convenience, as in the pine forests east of the mountains. Many of the readers of the *Lumberman* are familiar, by pictures and otherwise, with the old methods in use on the coast. In some cases long lines of oxen laboriously drag the logs through the woods, and in other cases tackling, operated by cattle or mule power, or sometimes by donkey engines, is employed to load the logs. But those methods are too slow, and are being superseded by steam power conveniently applied.

The necessity for some special means of handling these great logs led Mr. John Dolbeer, a large lumber operator of San Francisco, to think of attaching a steam windlass to an ordinary locomotive. A patent was granted him for a device by which the steam windlass could be thrown into gear with the driving wheels of the locomotive for the purpose of propelling it, or could be used separately for its legitimate work of lifting and handling logs. Since then the Baldwin Locomotive Works, of Philadelphia, have built, for logging railroads on the Pacific coast and elsewhere, a special type of double-end logging locomotives, equally adapted for running in either direction, and equipped with a powerful steam windlass at the forward end. Unlike Dolbeer's locomotive, however, the windlass is entirely disconnected from the driving gear of the locomotive, and the locomotive can be built either with or without it. The locomotives referred to have two pairs of driving wheels coupled and a two-wheeled or pony truck at each end. A saddle tank carries the water, and the rear truck carries a large wood box. The forward truck is center bearing, the rear truck side bearing. The wheel base is extended sufficiently to distribute the weight of the engine over a good length of track, while at the same time it is perfectly flexible, allowing the locomotive to run on the roughest track and pass the shortest curves with ease and without injury to itself or the track. A powerful steam brake acting on both pairs of driving wheels controls the motion of the engine on steep grades, and serves to lock it firmly while the windlass is in operation. The windlass is a Copeland & Bacon six inch double cylinder, with single or double gearing, as the weight of the logs to be handled requires

Some of the green redwood timber is very heavy, and will sink when put into water. The logs handled frequently weigh from twenty to thirty tons.

Redwood is the common lumber of the Pacific coast, taking the place of the pine and hemlock of the Eastern States and the deals of England. It is used for clapboards, siding, shingles, in fact for every purpose where it is not subject to wear. When dried, it is quite soft, and wears rapidly by attrition; it is, therefore, unsuitable for flooring, or stair purposes. It is used to some extent for railroad ties, though not so well adapted to this service as harder woods. Particularly on curves, the spikes become loosened by the lateral pressure against the rails. Redwood is remarkable in that its shrinkage is mainly in the direction of its length. Though its grain is usually straight, it can be found with grain curled, bird's eye, and other fantastic shapes, rivaling in this respect the most beautiful bird's eye and curly maple. Its rich color, much resembling red cedar, its beautiful grain, when carefully selected, and its great durability, when not subject to wear, make it most desirable for interior decoration. With the low transcontinental freights now ruling and likely to continue, it must become recognized in the Eastern States as a wood rich in economic and ornamental possibilities.—*Lumberman.*



DESIGN FOR AN ORNAMENTAL GATE.

Grano-Metallic Stone.

The grano-metallic stone, the invention of Mr. J. H. Bryant, of London, is composed of blast furnace slag and granite, which are crushed, chemically treated, dried, and mixed with Portland cement. For use these ingredients are brought to a pasty consistency with an alkaline solution, and laid. It possesses the important property of always having a rough surface, which is due to the atoms of the vitreous slag always presenting themselves just above the other ingredients, which are more readily worn. This stone has undergone a special trial in one of the metropolitan gas works, where a section was laid at the request of the engineer. It was there successfully subjected to tests which natural and artificial stones have, it is stated, been unable to withstand. It is found to stand not only the wear and tear of heavy horse and van traffic, but the sudden and extreme alternations of temperature incident to the slaking of coke upon it. Valuable as this material has proved itself for paving and road making purposes, however, it has now been proved to possess the additional important feature of being highly refractory.

A cement kiln lined with this stone has stood a number of burnings without any repairs having to be done. Even where the lining happened to be torn away by a portion of adhering clinker, there is not the least sign of the stone having been injuriously acted upon by the heat. This is certainly a most crucial test, and the satisfactory manner in which the stone has passed through it stamps it at once as an absolutely fire proof material, and, therefore, of special value for constructive purposes.—*Iron.*

ORNAMENTAL IRON GATE.

I send you a design of the gate belonging to the railing which was illustrated in your building edition for August, 1886, and which shows the crossed bars in the upper part.

In designing this gate, my endeavor has been to adhere as closely as possible to the outlines of the posts. All the cornered work (posts, etc.) is *octagonal.* In carrying out the design, the cast iron scroll work shown as of a circular or oval section in the drawing was made grooved and with edges rounded. The groove following all the contortions brings well out the intersections.

Ed. C. Magnus.

Crefeld, 1887.

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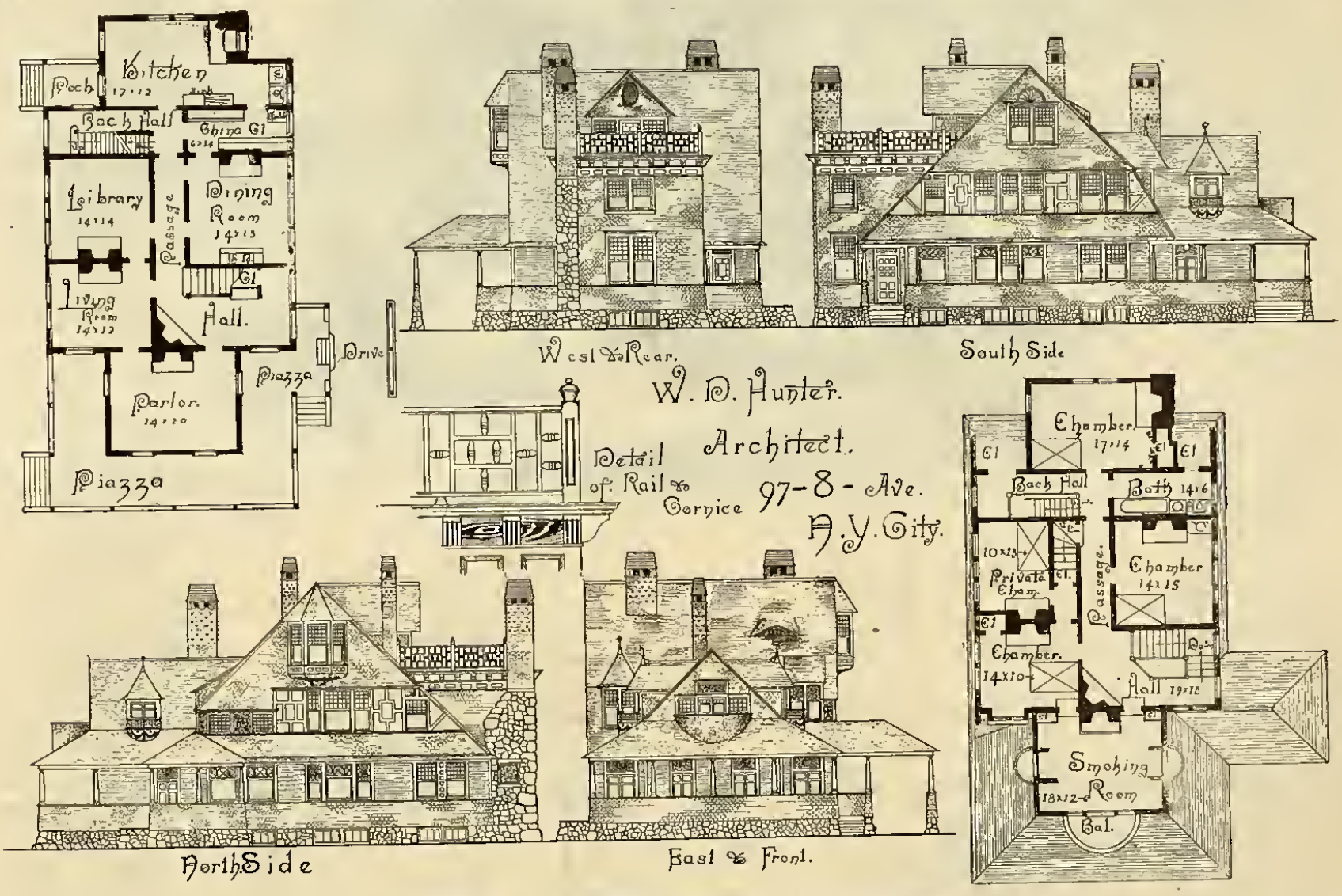
BRANCH OFFICE.—622 F Street, Washington, D. C.

DWELLING FOR AN ELEVATION.

This dwelling was designed by Wesley D. Hunter, architect, 97 Eighth Avenue, N. Y. City. It has a large hall and convenient porch. Rooms are large and well lighted, with plenty of closet room. The front faces the east and the rear is to overlook a valley. The roof of the rear projection is to answer the purpose of a tower. It is estimated to cost $7,000 to $8,000.



DESIGN FOR A DWELLING FOR AN ELEVATION.

Left-Handedness.

Dr. Daniel Wilson, president of the Royal Society of Canada, has lately contributed a paper to the *Proceedings* of that society on the subject of left-handedness, to which he has managed to give an unexpected and very practical interest, affecting all who have children or who are concerned in their education. The author had written previously on this subject, but not with such full and effective treatment. He reviews the various causes to which the general preference of the right hand has been ascribed, and also those to which the occasional cases of left-handedness are attributed, and finds them mostly unsatisfactory. He shows clearly that the preferential use of the right hand is not to be ascribed entirely to early training. On the contrary, in many instances where parents have tied up the left hand of a child to overcome the persistent preference for its use, the attempt has proved futile. He concludes that the general practice is probably due to the superior development of the left lobe of the brain, which, as is well known, is connected with the right side of the body. This view, as he shows, was originally suggested by the eminent anatomist, Professor Gratiolet. The author adopts and maintains it with much force, and adds the correlative view that "left-handedness is due to an exceptional development of the right hemisphere of the brain."

A careful review of the evidence gives strong reason for believing that what is now the cause of the preference for the right hand was originally an effect. Neither the apes nor any others of the lower animals show a similar inclination for the special use of the right limbs. It is a purely human attribute, and probably arose gradually from the use, by the earliest races of men, of the right arm in fighting, while the left arm was reserved to cover the left side of the body, where wounds, as their experience showed, were most dangerous. Those who neglected this precaution would be most likely to be killed; and hence, in the lapse of time, the natural survival would make the human race, in general, "right-handed," with occasional reversions, of course, by "atavism," to the left-handed or, more properly, the ambidexterous condition. The more frequent and energetic use of the right limbs would, of course, react upon the brain, and bring about the excessive development of the left lobe, such as now generally obtains.

The conclusions from this course of reasoning are very important. Through the effect of the irregular and abnormal development which has descended to us from our bellicose ancestors, one lobe of our brains and one side of our bodies are left in a neglected and weakened condition. The evidence which Dr. Wilson produces of the injury resulting from this cause is very striking. In the majority of cases the defect, though it cannot be wholly overcome, may be in great part cured by early training, which will strengthen at once both the body and the mind. "Whenever," he writes, "the early and persistent cultivation of the full use of both hands has been accomplished, the result is greater efficiency, without any corresponding awkwardness or defect. In certain arts and professions, both hands are necessarily called into play. The skillful surgeon finds an enormous advantage in being able to transfer his instrument from one hand to the other. The dentist has to multiply instruments to make up for the lack of such acquired power. The fencer who can transfer his weapon to the left hand places his adversary at a disadvantage. The lumberer finds it indispensable, in the operations of his wooderaft, to learn to chop timber right and left handed; and the carpenter may be frequently seen using the saw and hammer in either hand, and thereby not only resting his arm, but greatly facilitating his work. In all the fine arts the mastery of both hands is advantageous. The sculptor, the carver, the draughtsman, the engraver, and cameo cutter each has recourse at times to the left hand for special manipulative dexterity; the pianist depends little less on the left hand than on the right; and as for the organist, with the numerous pedals and stops of the modern grand organ, a quadrumanous musician would still find reason to envy the ampler scope which a Briarens could command."

That all this is true is abundantly shown by the numerous examples cited by the author, from the greatest of artists, the left-handed Lionardo da Vinci, to the distinguished ex-president of the American scientific association, Prof. Edward F. Morse, and (we may add) to Dr. Wilson himself, both of whom are known to be accomplished draughtsmen with this too-neglected hand. In view of these facts, it is evident that few more important subjects can be offered for the consideration of educators than that which is presented in this impressive essay.—*Science.*

The Building Employers' Protective Association.

After much deliberation and discussion, and with a unanimity of purpose peculiarly gratifying among such widely diversified callings, the various employing interests constituting the building trades of New York have resolved to organize into an association, having for its primary object the benefit of the workingman. Master painters, master plumbers, real estate dealers, carpenters, iron workers, framers, architects, masons, builders, roofers, plasterers, gas fitters, stair builders, builders, roofers, plasterers, gas fitters, stair builders, elevator builders, marble workers; steam fitters, bluestone cutters, artificial stone manufacturers, furnace and heater makers and setters, and dealers in plumbers' materials, are all represented in the Building Employers' Protective Association, and its first object is to insure to masters the right to employ whomsoever they will, regardless of union dictation.

The importance of the step thus taken cannot be overestimated. Although there is to be no interference between employers in the different branches of business on questions of wages or hours of labor, the federation, if honestly adhered to, will really control these factors.

Nowadays, if a master is asked to pay wages he considers too high, or to work such short hours as to endanger the fulfillment of his contract, he is coerced into agreement by threats of a strike. He knows that if he lets his union workmen go he is placed at a disadvantage, for all the union workmen of other denominations engaged on his buildings will refuse to work with non-union men, and in this manner heavy pressure is brought to bear on the employer of the strikers. Not only this, but the support one branch of trade furnished another tended to prolong strikes unnecessarily and augmented the trouble.

The workman unquestionably has the right to sell his labor at the highest price it will bring, nor do we deny his claim to say how many hours he will work, or under what conditions his labor shall be performed. Here, however, the limit of his prerogative, as dictated by the usages and necessities of society, is fixed. He has no right to step beyond it and tell his employer that no other man shall work for him if he does not choose to do so. In doing this, he perpetrates an injustice on the employer and on every non-union workman, no matter what his reasons may be for not joining a labor organization. As well might the butchers and bakers combine to dictate where and of whom necessary articles of food should be purchased.

It is this abuse of the power of organization the Building Employers' Protective Association has been organized to combat. To its members, just as much as to the Knights of Labor, or any other faction among workers, the injury of one is the concern of all. A strike against the employment of non-union men is probably to be followed by a lock-out of all striking trades, and in this manner the right of a master to employ whomsoever he chooses will be asserted. There will be no limit prescribed as to the right of workmen to strike, but they must not interfere with those taking their places—in other words, the members of this association declare the labor market open to everybody, and guarantee fair treatment to all that may enter it. —*The Sanitary Plumber.*

IT is probable that the artesian well now being bored at Pesth will be the deepest in the world, having indeed already reached a point entitling it to this prominence. It is sunk for the purpose of supplying the baths and other public establishments with hot water, the temperature aimed at being 176°, with a volume sufficient for the wants of the whole city.

A CHURCH OF MODERATE COST.

SPECIFICATION

of the work and materials required in finishing St. Andrew's Church, at Phenix, R. I., in accordance with drawings prepared by Messrs. Wm. R. Walker & Son, architects, Providence, R. I.

Furring.—Furr the walls of all rooms straight and true for lathing. Furr the ceilings of all rooms with ⅞ in. by 2 in. spruce furring strips, 16 in. from centers. Put up straight and true, and strongly nailed.

Grounds.—Put on ⅞ in. by 2 in. spruce grounds at the top line of base boards and chair or surbase moulding, and around the sides and tops of all doorways.

Partitions.—Partition the interior, as shown on floor plans, with 2 in. by 4¾ in. spruce partition studs, set 16 in. from centers, with two rows of 2 in. by 2 in. cross bridging in the height of same, and the studs doubled at the side of all doorways.

Lathing.—Lath the walls and ceilings of all rooms with five foot spruce laths, four nailings to each, and the end joints broken at every three laths, and the side joints laid 1¼ in. open.

Plastering.—Plaster all the walls and ceilings one good coat of brown plastering mortar, made from slaked, screened, and puttied lime, clean, sharp grit sand, and long cattle hair, mixed in suitable proportions for making strong mortar, and tempered with clean water. To be well rubbed into the joints between laths, forming good, strong clinches back of the same. To be trowel smoothed to a hard, even surface, when the mortar is in the proper state, so as to do without water in the smoothing. All angles to be screeded with long straight edges, and left clean, true, and straight.

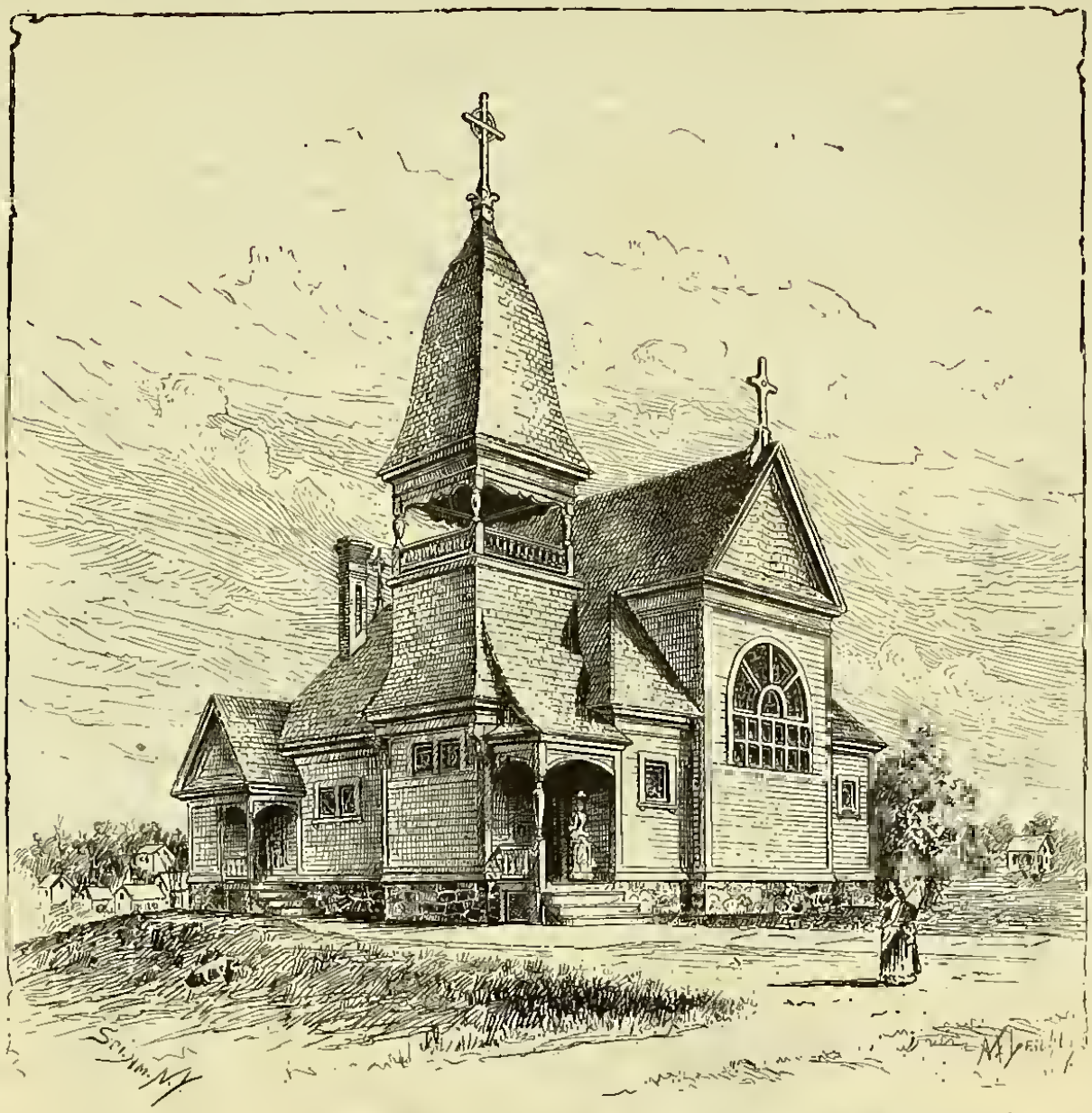
Chancel Arch.—The chancel arch to have stucco mouldings run around the corners of same, and left true, clean, and smooth. In the angle of wall and ceiling of chancel run a plain moulding stucco cornice, 8 in. down on walls by 12 in. out or up on ceiling. The plasterer to clean out and sweep out the mortar and plasterer's rubbish from the building as soon as his work is done, and to cover the glass in windows that are glazed, to prevent spattering of mortar thereon, and to protect walls from frost.

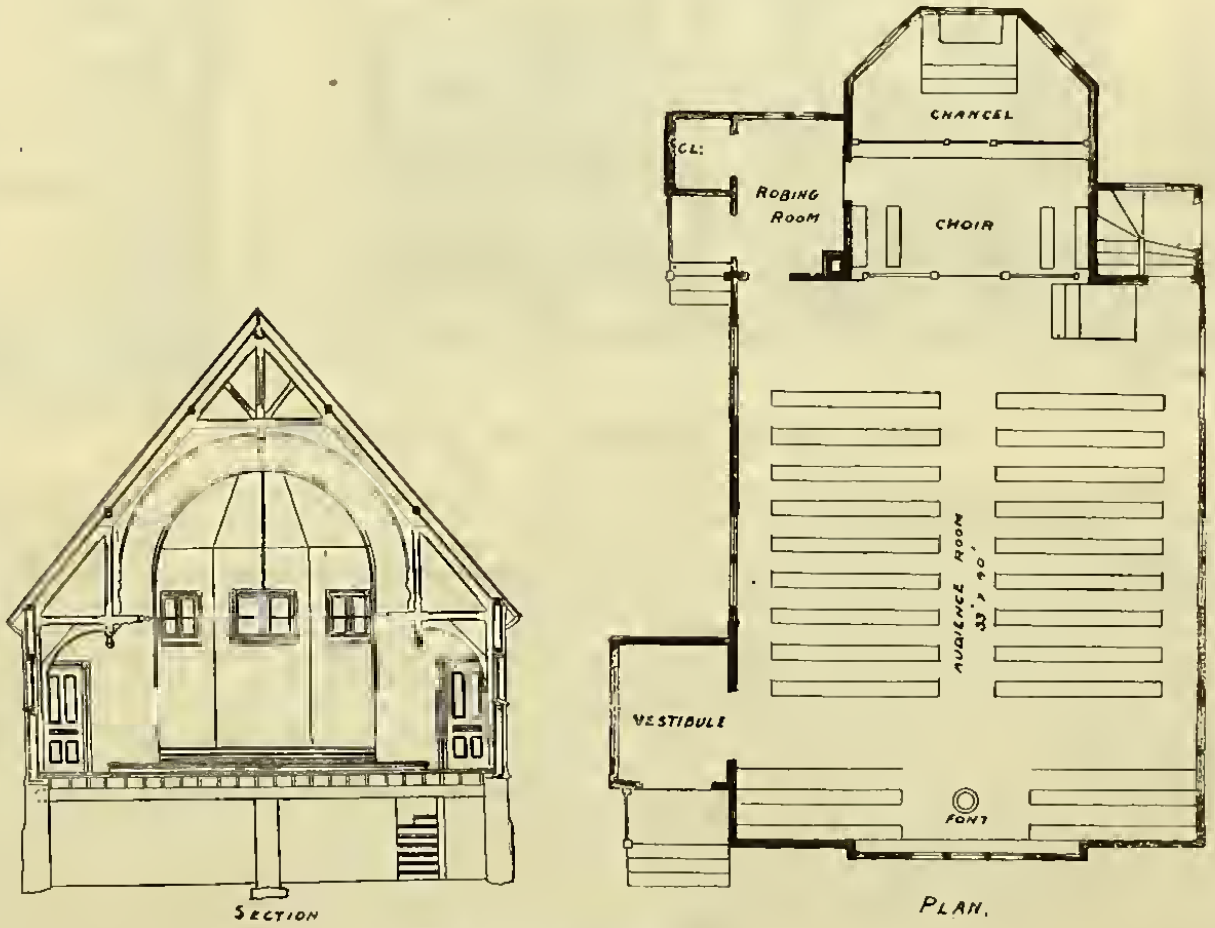
Interior Finish.—The interior of building to be finished in clear, dry seasoned and kiln dried white pine. The architraves around doors and windows to be ⅞ in. thick by 6 in. wide, with turned angle blocks at the top corners. The stool casings to be moulded with moulded apron under same. The base boards to be ⅞ in. thick by 10 in. wide, with a ⅞ in. by 3 in. moulding top of same. The surbase moulding around the walls of auditorium and chancel to be ⅞ in. thick by 6 in. wide, with moulded edges and faces. At all external corners, between base and surbase, put in turned white pine corners 1¾ in. in diameter, with 2¾ in. turned heads at both ends. Thresholds to be clear Southern hard pine ¾ in. thick.

Floors.—Furnish and lay down the top floor of all rooms fine, clear, dry seasoned and kiln dried matched ⅞ in. Southern hard pine of the best quality, to be blind nailed into every floor joist, and the joints planed off level and smooth. The flooring of chancel to be raised up one step high at each break shown on floor plan, and the front edge of step moulded with a cove under same.

Doors.—The inside doors to be made from clear white pine, of the sizes and forms shown on plans, to be 1¾ in. thick, with moulded panels, to be hung to frames with stout 5 in. by 5 in. japanned and nickel tipped butts, and trimmed with lock, latch, and plain brass 2¼ in. knob. There will be no door between the robing room and chancel, the opening to be cased up same as other doors, but without rabbet in the jamb.

Finally.—All work to be done in a good and workmanlike manner. All the mouldings to be sandpapered clean and smooth, and the back edges jointed smooth.





SECTION PLAN.

A CHURCH OF MODERATE COST.

THE new "*Cement de Paris*," says *Construction Moderne*, which, it is claimed, besides being water proof, has other important points of superiority, is made by pulverizing the stone while roasting in the kiln, instead of afterward, as is the case with common lime.

A $3,000 RESIDENCE.

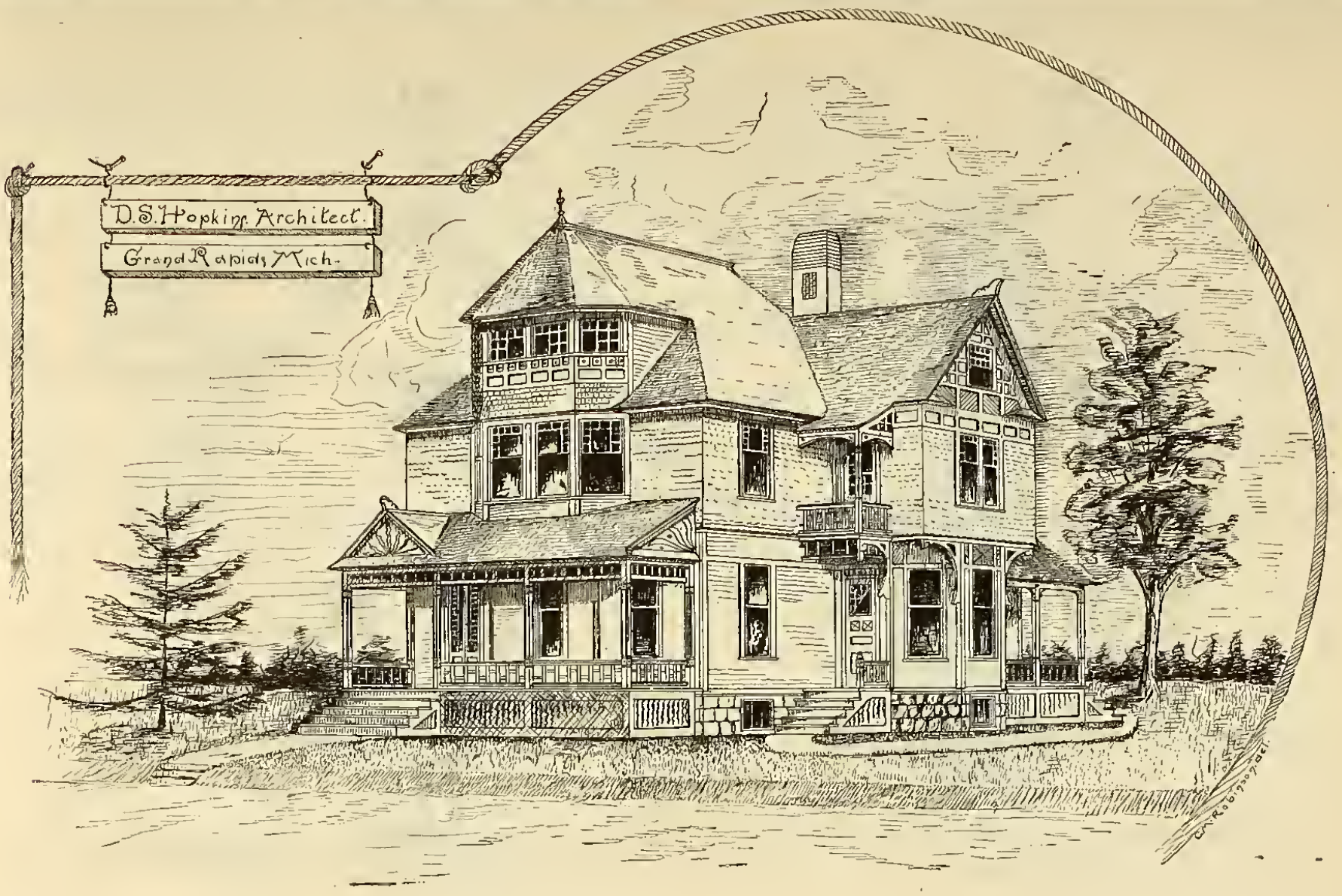
This cottage, designed by D. S. Hopkins, architect, Grand Rapids, Mich., is built of wood. Stone foundations. Cellar under entire house, with brick partitions in same. The frame is sheathed with matched pine, and paper lined throughout. First story is inclosed with 4 in. pine siding, second story shingled with best fancy cut pine shingles. Roofs are covered with the best pine shingles. The house is to be painted in three bright harmonious colors.

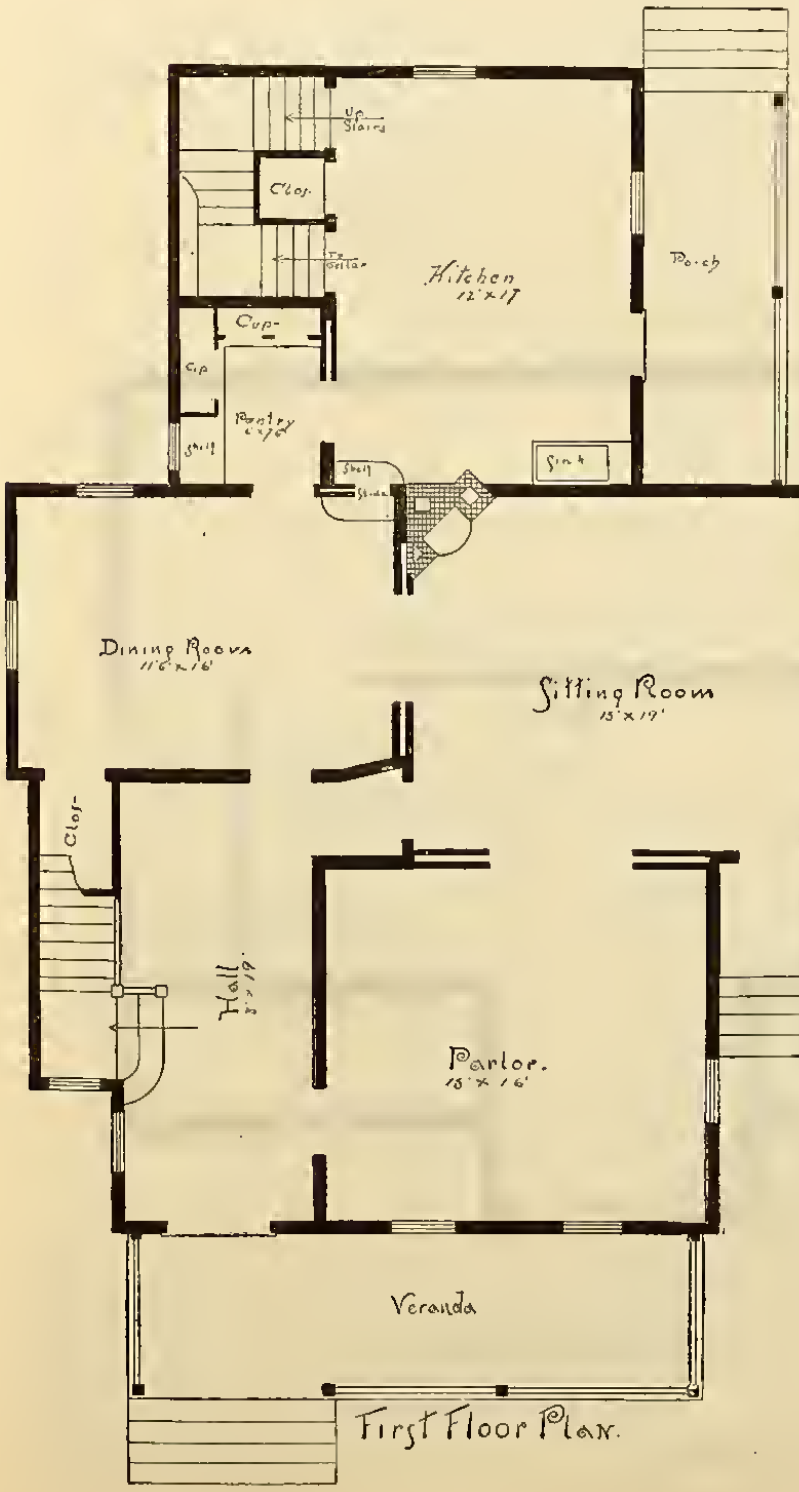
The interior shows rooms all of good size, and conveniently arranged. The first floor principal rooms are thrown together with sliding doors. Front hall is large. Stairs of good width and easy run. The kitchen is large and is provided with all conveniences, closet, etc., with stairs to cellar and second floor. The second story principal rooms are all of good size and provided with closets. Bath room is convenient and well ventilated. The front rooms have a bay projection, which extends up to roof, and makes a very pleasing feature on the exterior, and also gives a very pleasant attic room, large enough for a billiard room or for any other uses, as desired. The heating of this dwelling was designed for furnace, and has but one chimney on that account. Another chimney could be provided for, when stove heating is desired. The inside finish is neat and plain. Pilaster style of finish, all pine finished in natural wood or painted, as preferred. This house all complete, including plumbing (without heating), is estimated to cost three thousand dollars.

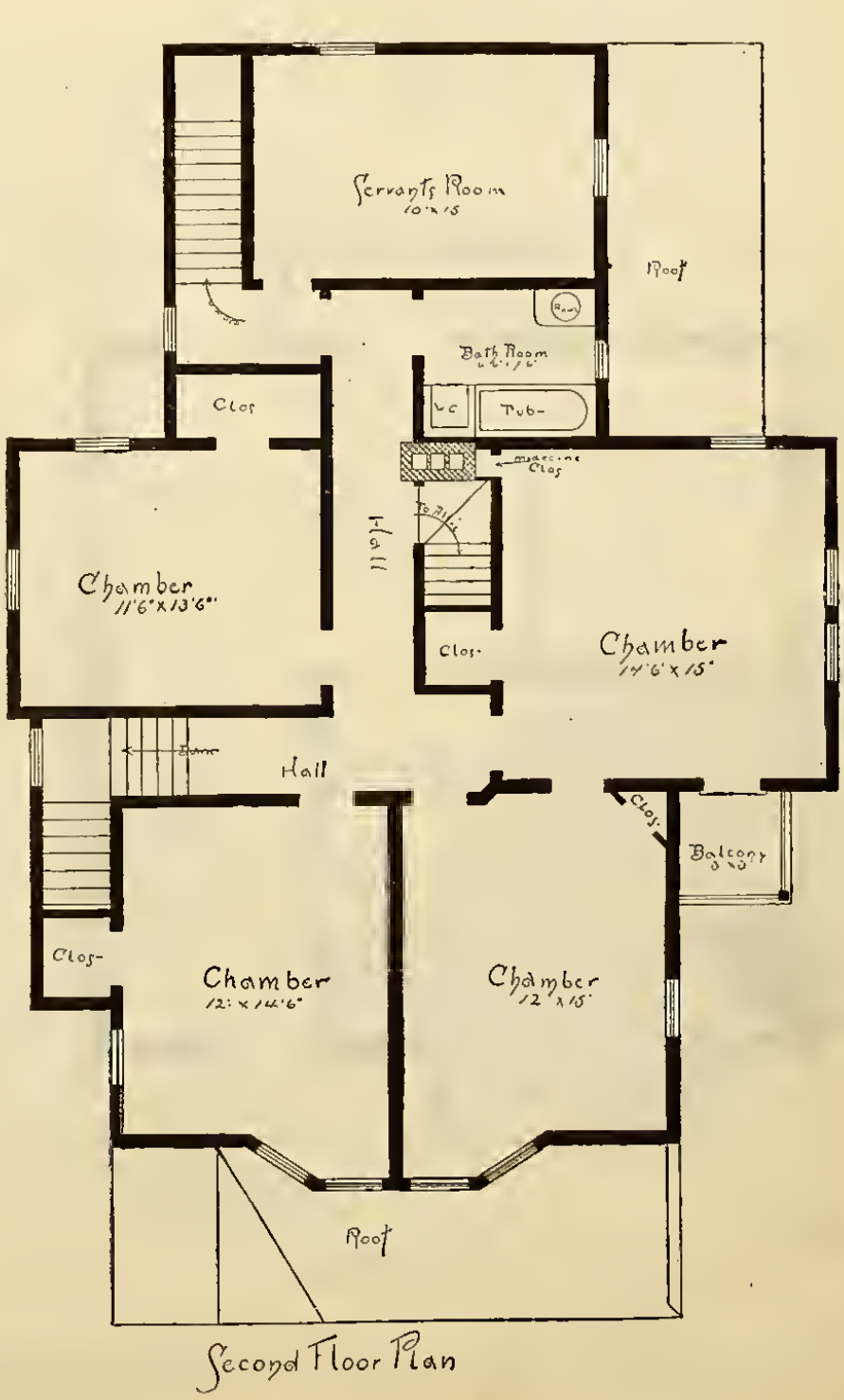
Maple Flooring.

"Maple flooring," the New York gentleman remarked, "does not receive the attention in our market that it deserves. The architects are decidedly hard headed. Of all men, they should be progressive and up to the times, but they linger by the way in a provoking manner. They have been used to yellow pine flooring, and yellow pine flooring it must be to the end of the law. Now as between the two kinds of flooring, maple and yellow pine, I consider maple much superior in most cases. Especially when trucks are run over the floor, or it is otherwise subject to heavy work, maple leads so far that yellow pine is nowhere. Keep a maple floor damp, and the heavier the business done on it, the harder the boards become. The wear there is in it is simply astonishing. The architects, however, seem to care little for that. They go on, on, in the same old rut. If the use of maple for flooring were an experiment, there might be some excuse for this pigheadedness, but it is no experiment. It has been tried and not found wanting in a single respect."—*Northwestern Lumberman.*

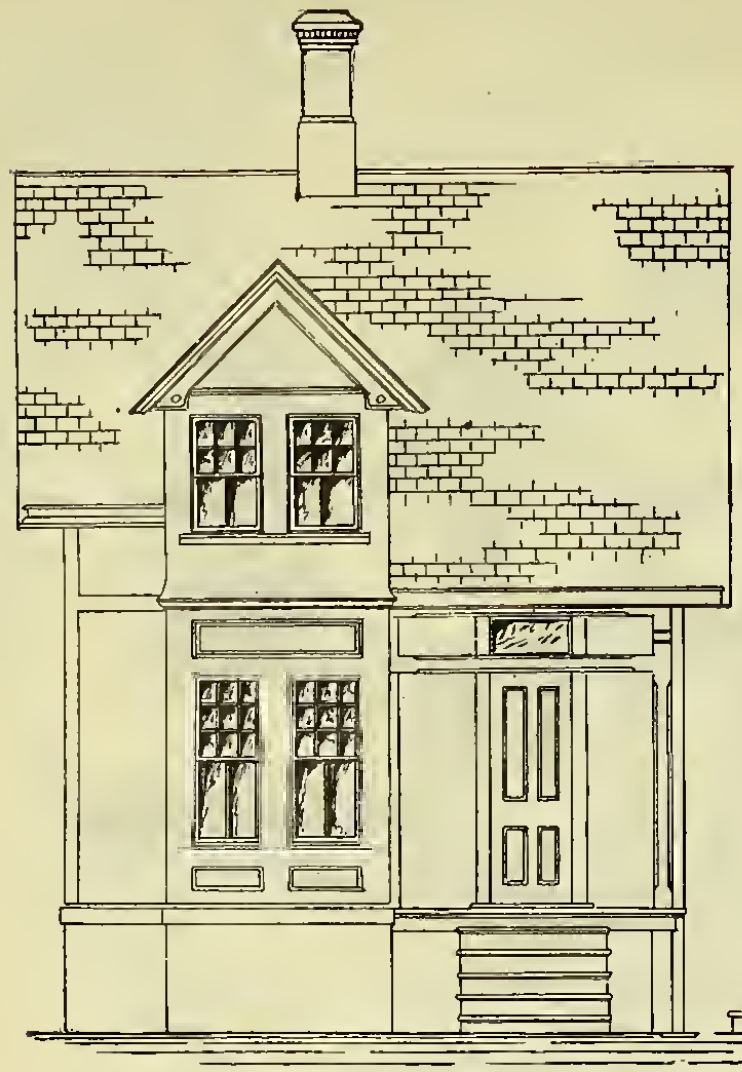
FULL plans and specifications for any of the various buildings illustrated in this work may be obtained, on very moderate terms, at this office. These include churches, schools, dwellings, enlargements, extensions, wings, etc. The two volumes for the past year, which may be purchased for $3, contain nearly 200 elevations and many plans. Address Munn & Co., 361 Broadway, Architects and Builders Edition SCIENTIFIC AMERICAN.





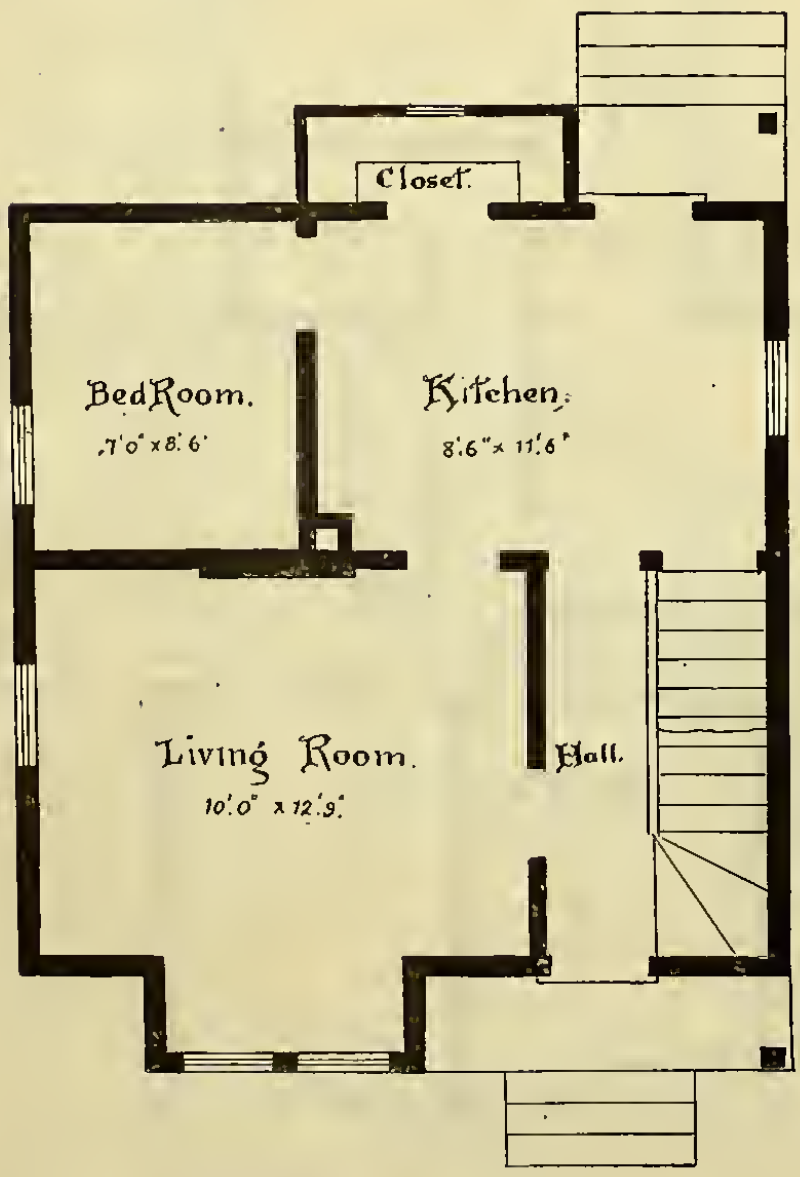


A THREE THOUSAND DOLLAR RESIDENCE.

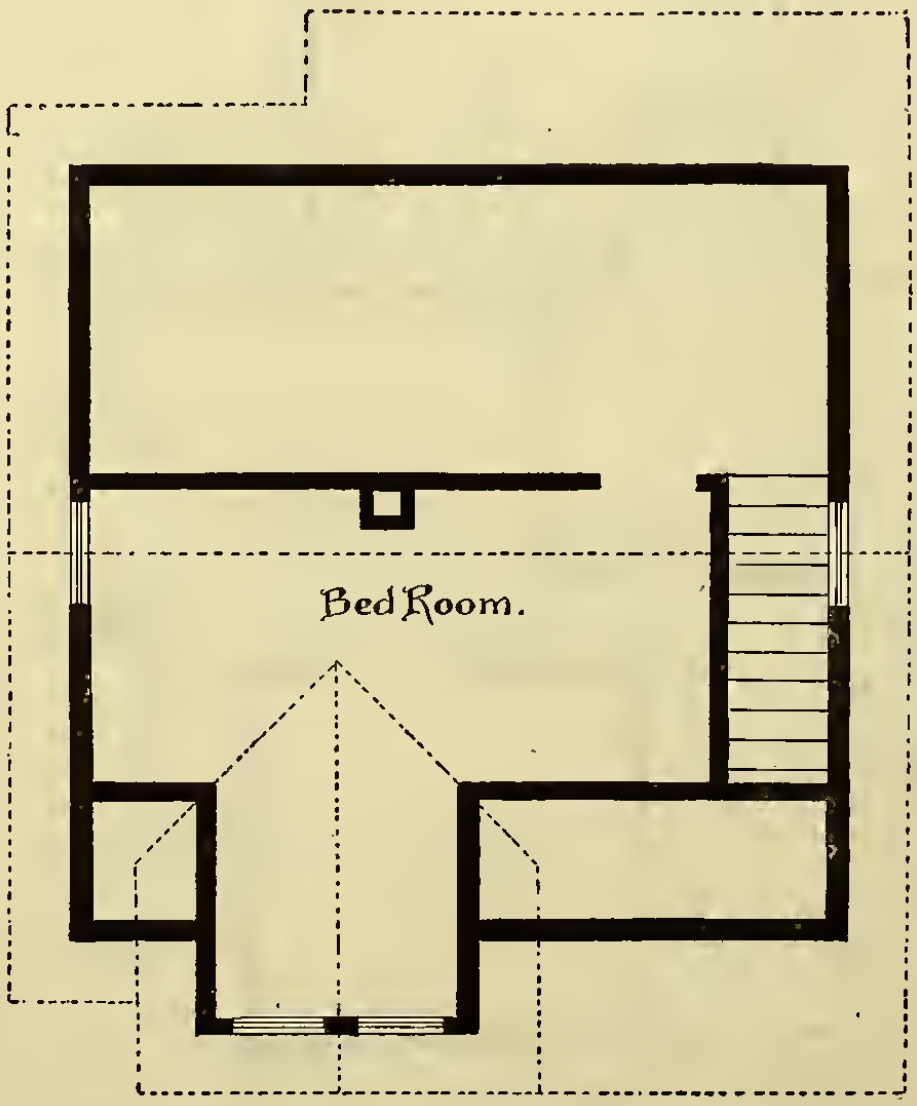


Front Elevation.

Side Elevation.



First Floor Plan



Chamber Plan.

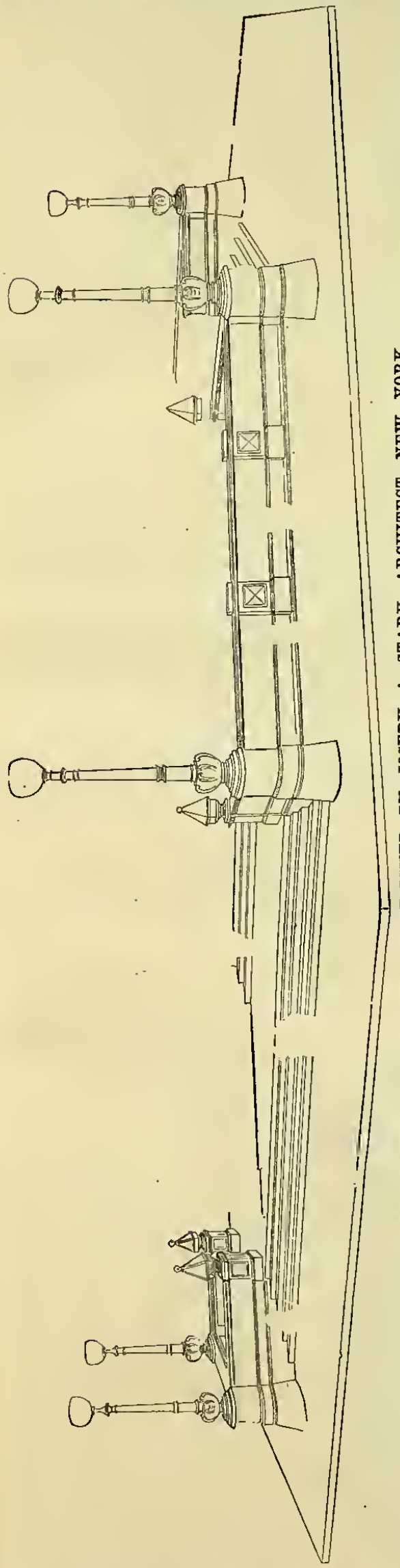
A ONE THOUSAND DOLLAR COTTAGE.

[For description see page 91.]

A MONUMENT TO THE MEMORY OF GENERAL GRANT.

DESIGNED AND DRAWN BY JOSEPH A. STARK, ARCHITECT, 12 CHAMBERS STREET, N. Y.

The illustrations show a composition of a truly monumental character. The proportions of the structure are very fine, and work up to an impressive whole The design is a symmetrical one, and the perspective view is equally effective from all sides. At the same time, the



MONUMENT TO GEN. GRANT.—DESIGNED BY JOSEPH A. STARK, ARCHITECT, NEW YORK.

actual dimensions are not excessive, and the cost is such that the entire work, including all statuary and sculptured relief work, can be carried out in a perfect manner for the sum of $250,000. This sum would cover the employment of choice materials throughout; of rich and rare marbles for the columns, pedestals, and interior wainscoting of the pavilion and crypt. Ten pieces of bronze statuary are included, of one and one-half life size; also four bass-relief battle pieces for the pedestal of General Grant, and eight medallion heads of leading men famous in the history of the war. These are intended for the four main pillars of the pavilion and crypt.

The general material of the structure is intended to be a warm-colored limestone; steps and terrace paving of marble tiles. Candelabra, pedestal ornaments, arch spandrel pieces, and the winding laurel leaf ornament around the four columns are intended for bronze.

The pyramidal dome is of stone, richly ornamented with a bronze gutter, and apex for the crowning figure, "Union Triumphant." The domed ceiling of the pavilion is intended of segmental section, treated with marble mosaic. The arcaded frieze is specially introduced in the design to light up this ceiling. It is no mere ornament.

The idea of the design is, withal, a very simple one. It is this simplicity and directness of the thought which is the secret of the dignified grace and grandeur of this composition.

It is a monument of glorification to a man, and it is also his tomb. The statue of the General stands on an appropriate pedestal in the center of a square pavilion. The pavilion is raised above the ground on a terrace of ornamental outline, to which steps lead from three sides. The terrace is about 80 feet square. The pavilion is 25 feet square. It is pierced on its four sides by circular arches, 15 feet span and 25 feet high. Above the arches is the arcaded frieze to light up the domed pavilion ceiling. The four corners of the pavilion are ornamented and emphasized by rich detached columns on pedestals, from which large reclining scrolls descend. These finish with a pedestal, on which is placed an appropriate statue. These four statues might be Victory, Defeat, Peace, and War. The object of the scrolls is to give architectural base and emphasis to the pavilion, and also to connect closely with the monument proper all the other sculptural works. The columns are crowned by a cornice and pedestals on which are placed statuary groups representing the four arms, infantry, cavalry, artillery, and the navy. The pavilion is roofed with a pyramid in stone, richly designed and finished with a crowned figure, "Union Triumphant." The total height of the monument from the ground level to top of apex statue is about 70 feet.

The style of design is severe modern Renaissance, richly treated, which is the only style of architecture appropriate

Under the monument the crypt is arranged. It is reached by stone stairs, where shown on the plans. The crypt is a square vaulted chamber, with the sarcophagus in the center. It has four circular niches to give additional space for placing trophies and mementoes of the war, and for visitors' seats. The crypt is intended to be lined with choice marbles, and to have a mosaic vaulted ceiling. Provision is made for daylight to enter through the ceiling.

Here is a monument of meritorious design, of adequate dimensions, and of rich and tasteful treatment in its architectural and sculptural features.

In its radiance of marble, bronze, and gold, it would be a worthy tribute to our great hero. The structure can be erected complete in an opulent style for the sum of $250,000.

This does not say that General Grant does not deserve a million monuments. It simply says that a million is not necessary to produce a monument worthy the man and the occasion. It is difficult to see how even a million dollars will produce something more truly monumental, appropriate, or complete.

The author of the design, Mr. Joseph A. Stark, architect, of No. 12 Chambers Street, N. Y., will be pleased to show the original drawings and give any further desired information.

Shingles in Modern Architecture.

Those who have watched the tendency, or, we may say, the evolution, of style in wooden suburban and country houses, must have noticed the gradual disappearance of the monotonous and uninteresting clapboard, with its uncompromising horizontal lines.

The cry is, "The clapboard must go," and it is going. But what is replacing it? The answer is instantaneous—the shingle. With the many ingenious methods of laying shingles, the greatest variety of effect can be obtained without cutting them at all.

But now comes the important question of coloring. At first paint was used, but the dull monotony of masses of color covering the grain of the wood has now almost universally given way before the modern creosote stains. Many attempts have been made to imitate the effect of stains without using creosote, but they have been sad failures, as other oils do not penetrate the wood and bring out the grain in relief. A test was recently made at the request of well known architects of Boston, by a prominent chemist, of all the materials sold under the name of "stains." The result was that he pronounced "Cabot's Creosote Stains" among the best of them all.

These creosote stains have already been so long in use that the preserving properties of the creosote have begun to show their value on houses in all parts of the United States.

There are no more picturesque houses in New England than many of the shingled villas and cottages of recent date, and we cannot avoid the conviction that much of their beautiful harmony of color with design is due to the almost universal use of the stains above mentioned.

CANNON'S DIAMOND POINT NAIL SET.

The accompanying illustration shows an ordinary nail set, the efficiency of which has been vastly increased by a specially hardened diamond-shaped point or tit formed on its end. It is evident that the slightest blow of the hammer will cause this point to catch in the head of the nail, and thereby prevent the set from slipping. This will save in many cases valuable pieces of work from injury, as the set will surely follow a nail through any piece of stuff without slipping off. These sets are made from the best quality tool steel; the points are thoroughly tempered, and will not break off. This essential improvement is manufactured by the Edward Storm Spring Company (Limited), of Poughkeepsie, N. Y., to whom all communications should be addressed.

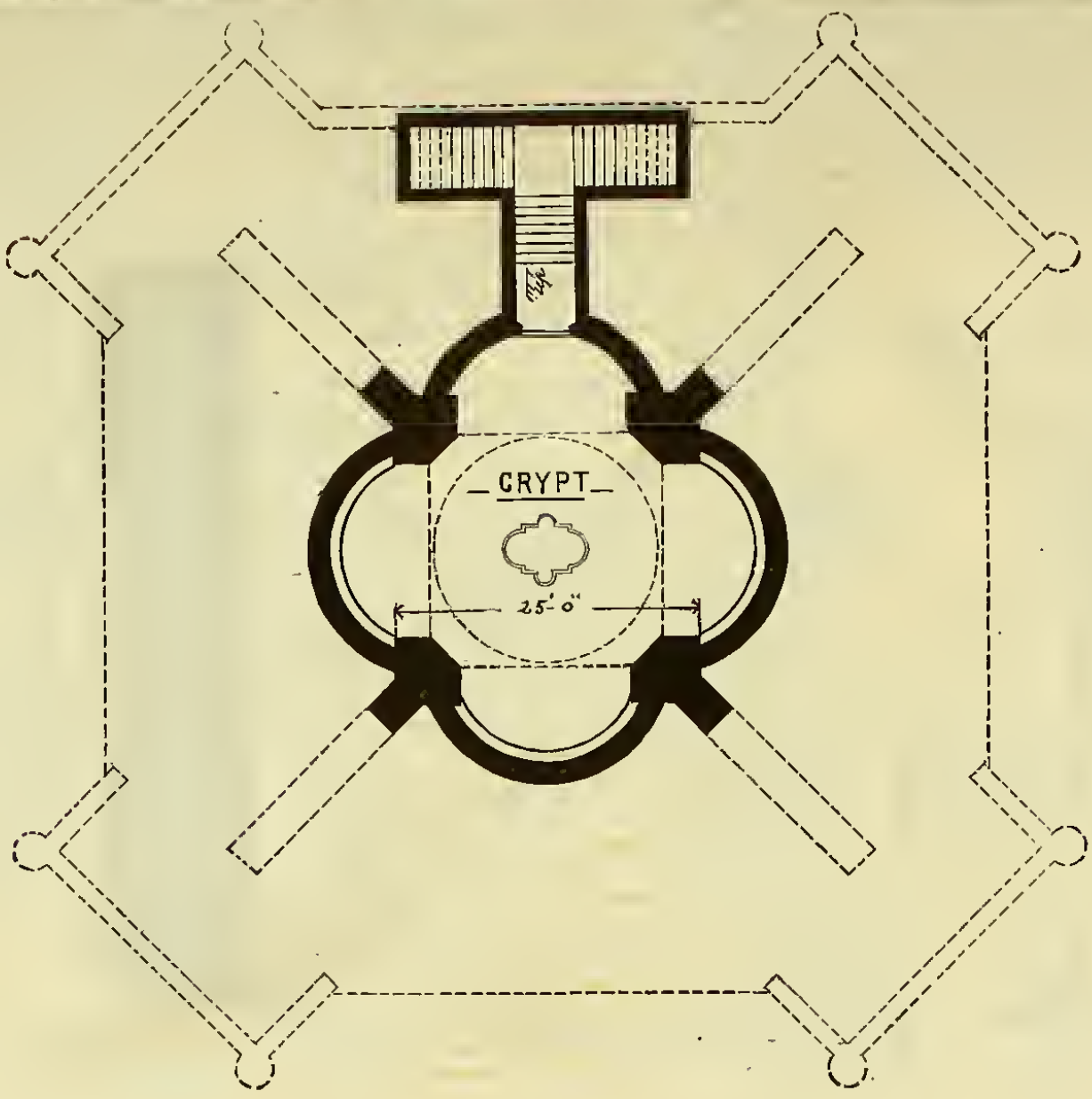
ADJUSTABLE WOOD MEASURING RACK.

By means of this device, wood may be measured by the cord or fractional parts of a cord, as occasion may require. The sill frame consists of two longitudinally ranging timbers, connected by cross bars. Near one end of the timbers are fixed uprights, braced to each other and to the timbers. To the inner faces of the sills are screwed a series of headed pins, the first one being exactly one foot from the inner face of the end posts, and the others being spaced one foot apart. Two posts, braced together by rods, are adapted to stand on the sills, and to the inside face of each post is attached, by coach screws, a metal plate provided with a hook at its lower end, adapted to engage with the shank of one of the headed screw pins of the sills. Attached to such post is a brace with two arms, and formed at its lower end with a notch to engage the pins on the sills. The metal plates and braces are slotted for the passage of the screws, so that the movable frame may be quickly and easily set perfectly plumb, whichever opposite pair of the sill pins may be engaged by the hooked plates. The posts are exactly four feet high, and one is marked by cross lines one foot apart. It is apparent that, to measure a cord, the frame is moved to the eighth set of pins and the wood is piled to the tops of the posts. To measure half a cord, the hooks are engaged with the fourth pins. By adjusting the hooks to the first pair of pins, and filling the wood in between the end posts up to the first cross line on the post, a single foot of wood can be measured, or up to the second line for two feet, and so on. Thus a cord or any fractional part can be readily measured. To disengage the frame, it is only necessary to tilt it forward toward the fixed posts, when it may be shifted to any point along the sill frame.

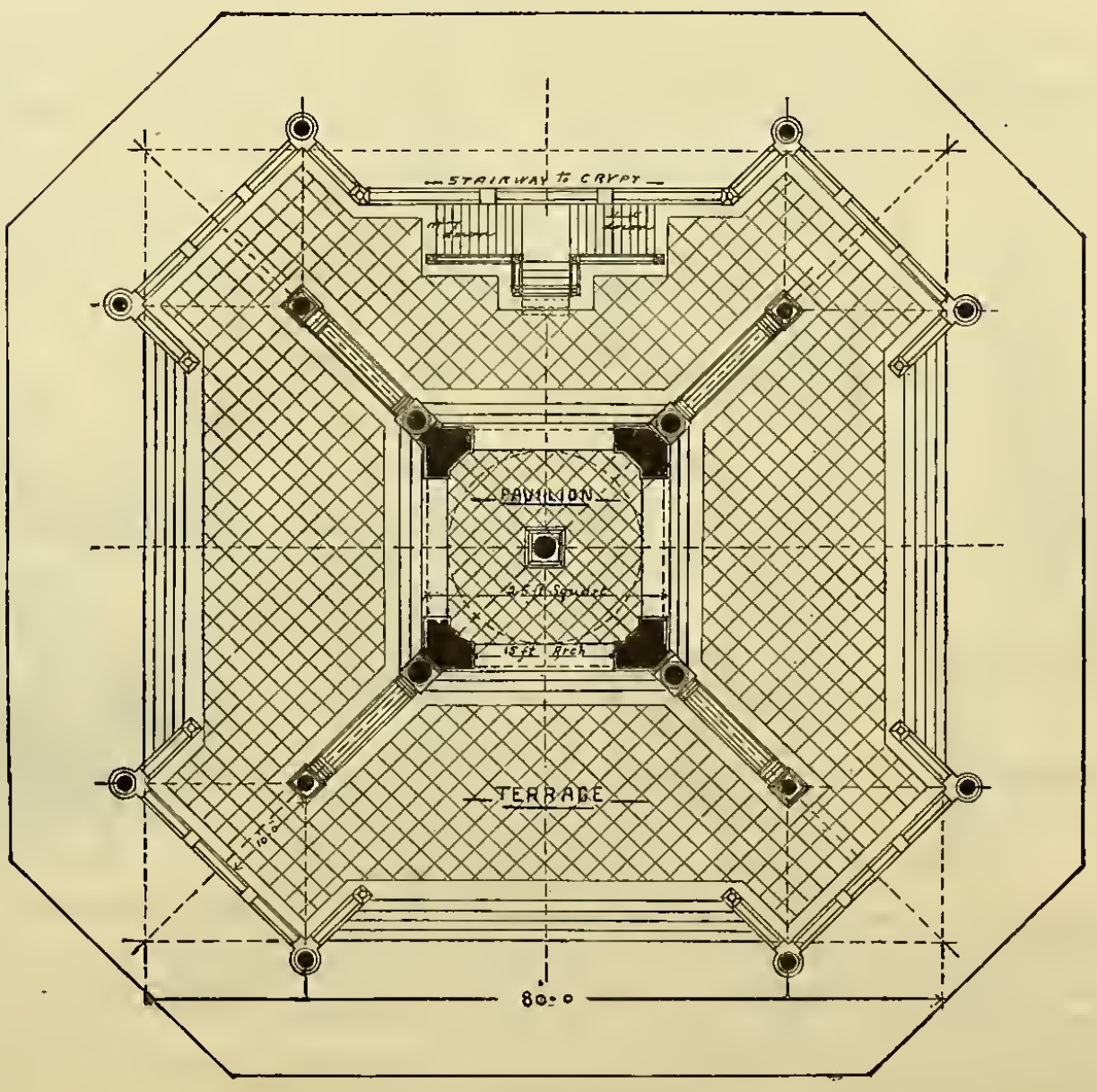
BROUGHTON'S ADJUSTABLE WOOD MEASURING RACK.

This invention has been patented by Mr. Horace L. Broughton, whose address is P. O. box 320, Marblehead, Mass.

THE German colliery owners are about to prohibit blasting with black powder in fiery mines; also the use of naked lights in every part of the workings, as well as a mixed system of safety lamps.

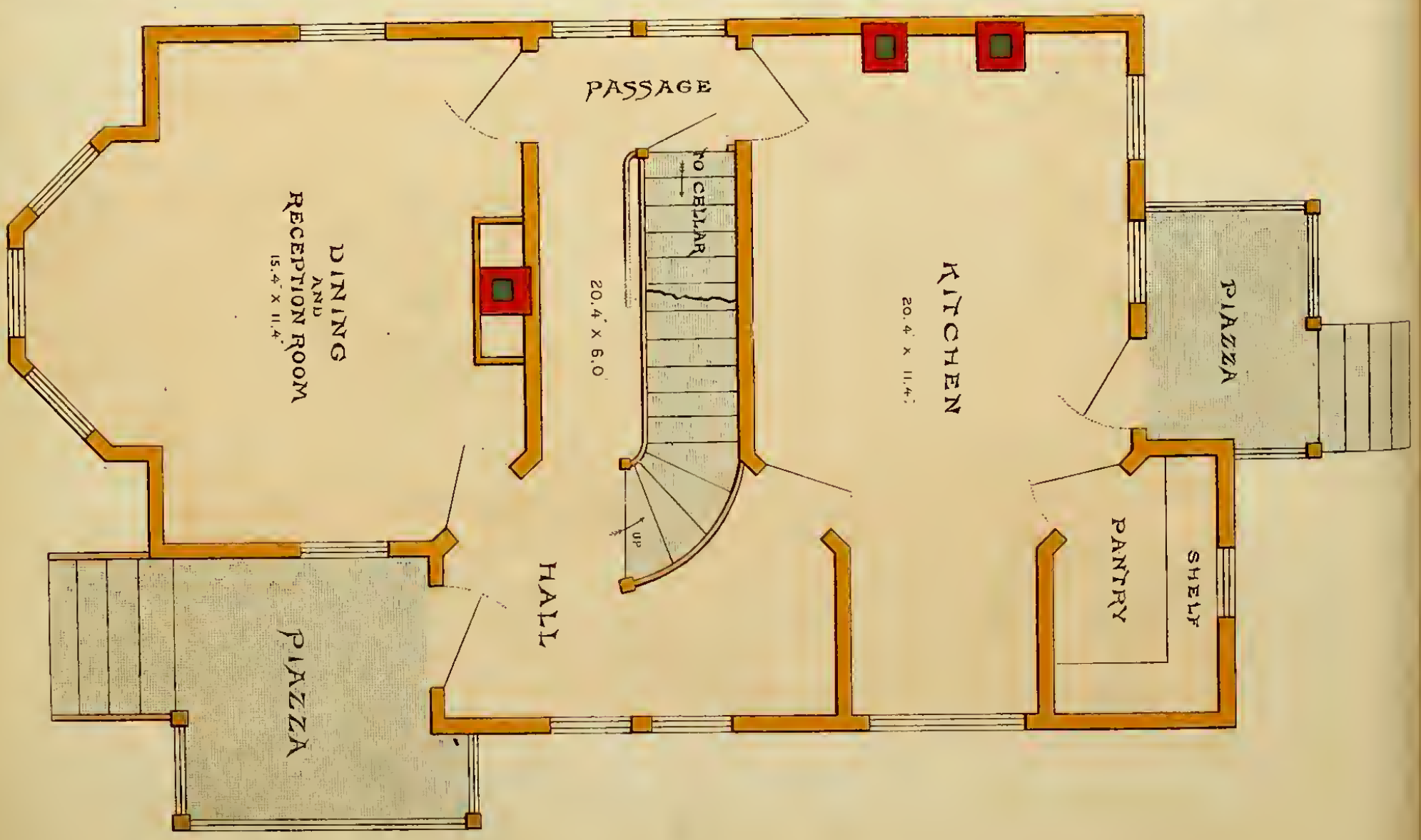


PLAN OF CRYPT AND OF FOUNDATIONS

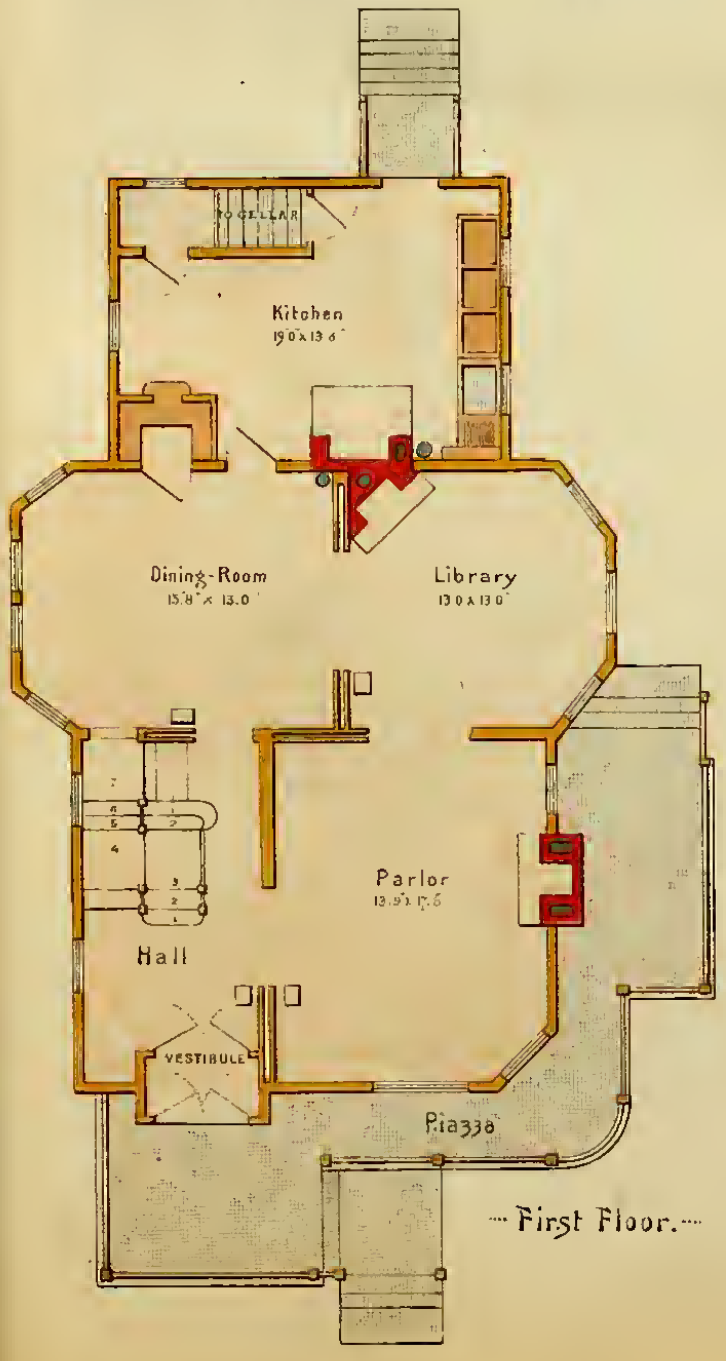


PLAN OF MONUMENT.

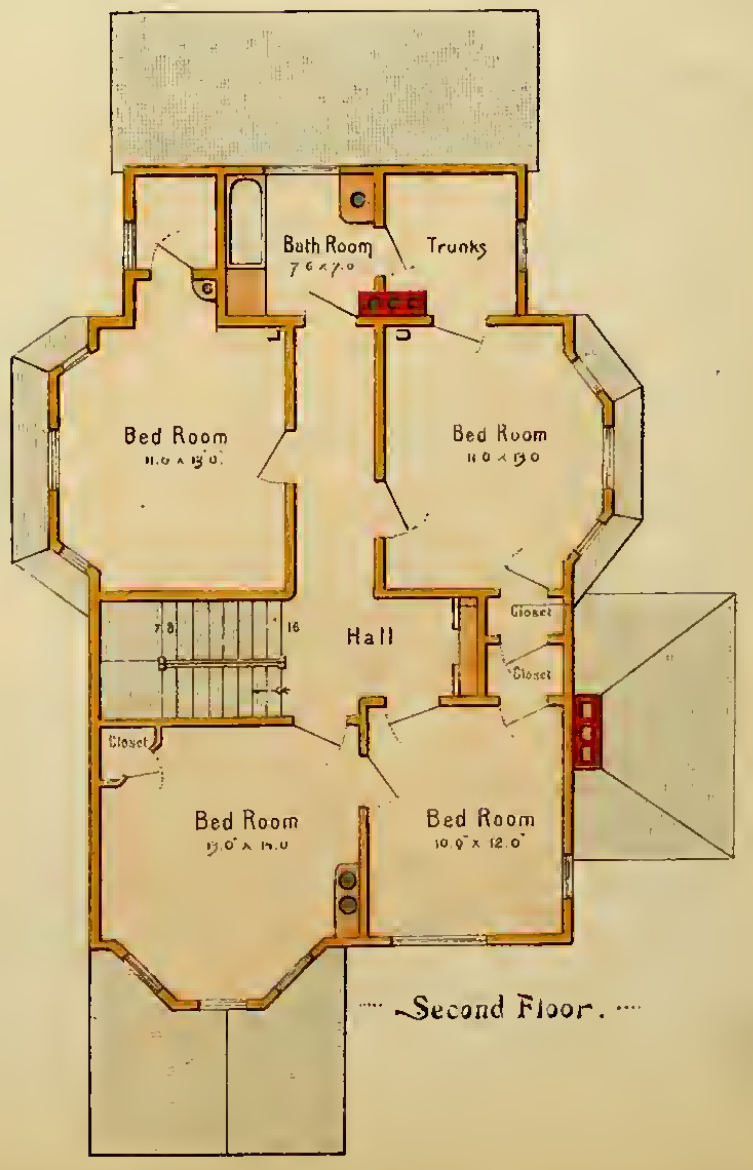
A COTTAGE OF MODERATE COST INTENDED FOR FUTURE ENLARGEMENT.



RESIDENCE OF F.W. COOLBAUGH, ESQ. EAST ORANGE N.J. GEORGE COOKE, ARCHITECT.

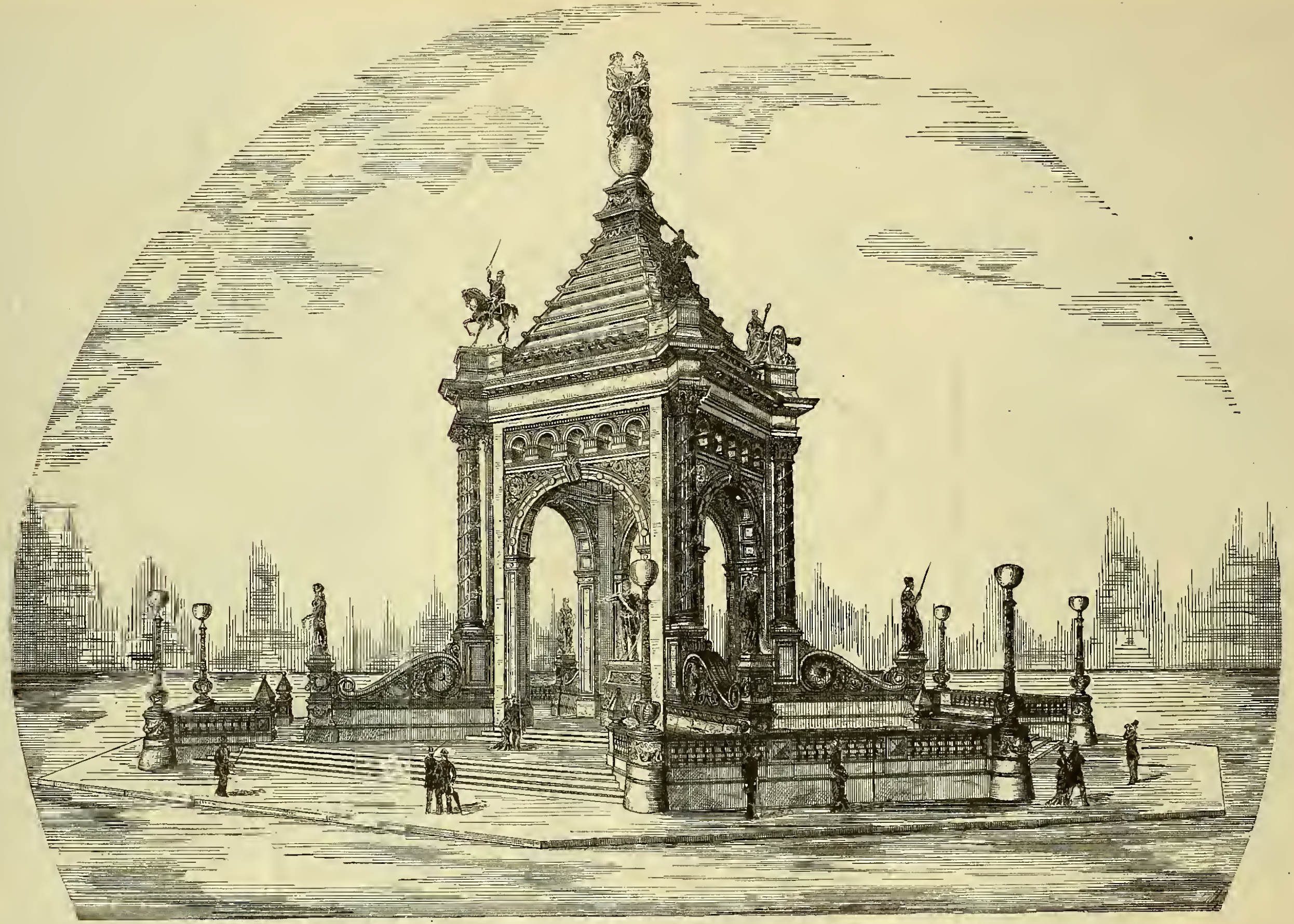


First Floor.



Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK.



DESIGNED AND DRAWN BY JOSEPH A STARK ARCHITECT, 12 CHAMBERS ST. N.Y.

PICTURESQUE SUMMER HOTEL.

The illustrations presented in this issue for a suburban hotel, by Mr. Geo. Edw. Harding, architect, No. 40 Exchange Place, N. Y., exhibit a novel departure from the hitherto stereotyped lines of similar structures.

Its strong, salient angle, accentuated by the prominent tower and chimney, with its receding wings, artistically broken by the square stone tower and twin gables, combines effective architectural grouping with a simple style of treatment which pleases by its varying outline of plan and sky lines.

The first story and square tower throughout is constructed of random rubble masonry, while the upper portion is sheathed with creosote-stained shingles, cut to patterns, and roofed with hand-split oak shingles, laid "in and out," of natural color, giving a most picturesque appearance without apparent effort.

In the plans it will be noticed that the executive offices, while convenient for guests, are still central for commanding the various dependent departments and their general service.

The music room, grand parlor, and dining room are *en suite*, which affords opportunity for evening dances, amateur theatricals, or concerts, with the verandas in convenient proximity. The feature of an open loggia for dining in pleasant weather, with a band piazza above, is novel, and, we should think, a delightful arrangement for its patrons.

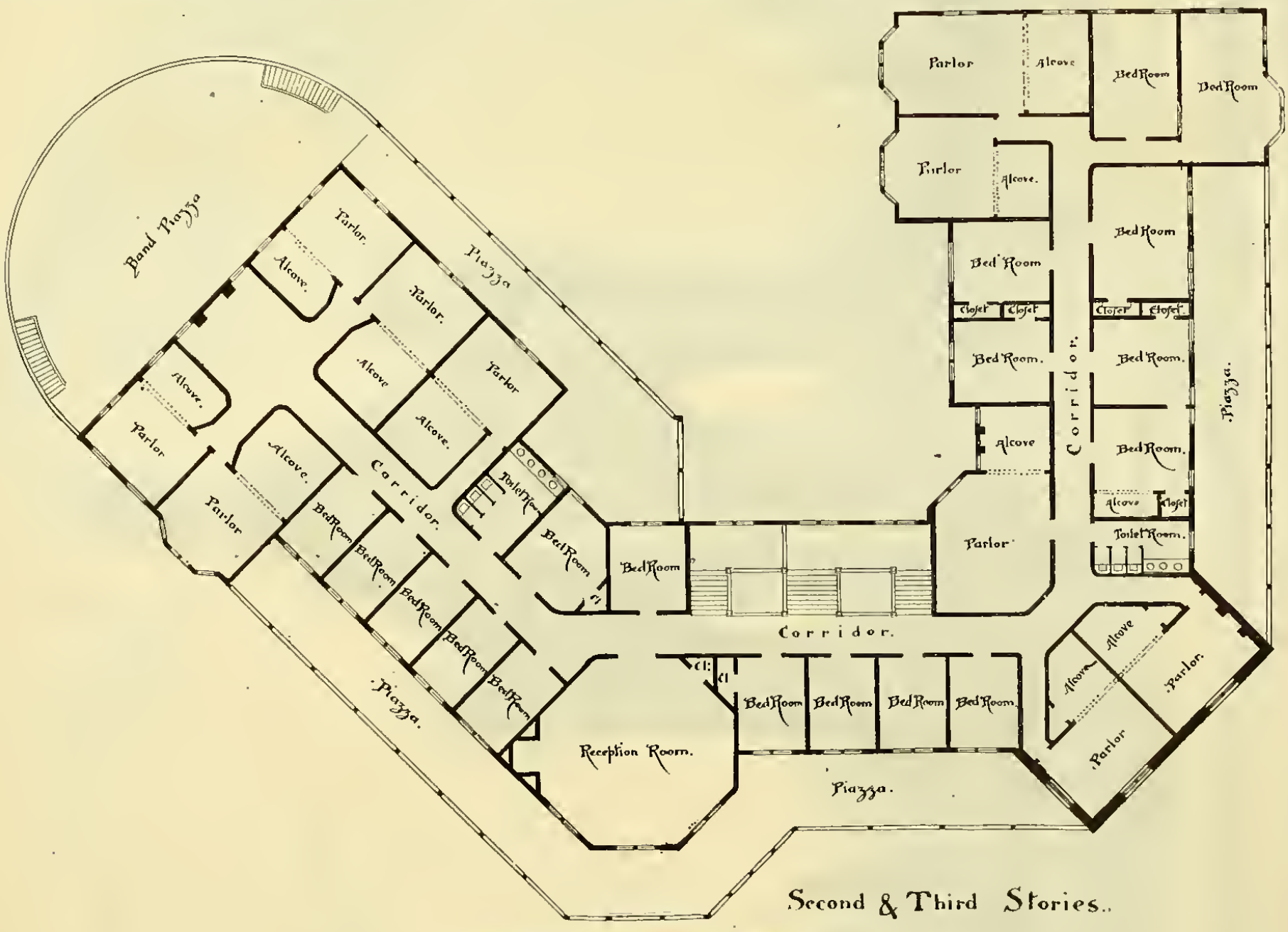
The chambers and corridors are superior in their resulting light and ventilation, while success is assured by the peculiar plan of arrangement, which strongly commends itself for sites where the land or water scape affords interesting views from varying points.

The floors are of comb-grained Georgia pine, and the trim is of stained ash and natural cherry, no painting being allowed inside or out.

The plaster is cathedral finish, the mortar being also stained by blending the desired colors when mixing in the bed. The mantels are of buff terra cotta, moulded in flat relief, with brick linings of similar tone.

Peculiar features in the culinary department are an old fashioned brick oven, such as our forefathers were accustomed to have their baking done in, and an open, wide grate, 7 ft. long by 2½ ft. high, in front of which all the roasted fowls are revolved by a "turnspit," operated by a smoke jack in the flue above, which would seem to prove that some of the old methods of cooking deserve imitation even in the present days of French cooks.

The present design is about being erected in the vicinity of this city, at a cost of $48,000.



DESIGN FOR A SUMMER HOTEL.

The Use of Mortar During Frost.

Some time ago the police authorities of Berlin issued an order forbidding the construction of brickwork should the temperature fall to or below 2 degrees R. (26 degrees Fahrenheit). This order being based on the supposition that mortar freezes at that temperature, and does not set, Herr Krause, architect, of Stropp, sent a communication to the *Baugewerke-Zeitung*, in which he publishes his experiences, which by no means seem to bear out the necessity for issuing the order. We give a *resume* of Herr Krause's remarks, as well as of the opinions of some other German architects upon the matter. Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very heavy, sharp frost, the temperature being down to from 4 degrees to 8 degrees R. (23 degrees to 14 degrees Fahrenheit). As bricks and sand were frozen, his workmen had great trouble in properly setting the bricks, the mortar freezing under their hands. It would have been too expensive to warm all the materials previously. He, therefore, had the lime slaked in small quantities, mixed the mortar hot, and had the brickwork liberally pointed. He fully expected to find the mortar perished in the spring. But he was greatly mistaken, for the work was as firm as if it had stood for several years. In 1880 he had to take the same building down, when the mortar was found so firm that the bricks broke and could be cleaned only with difficulty. Herr Krause subsequently had other pointing done at several degrees of frost, and always found that, if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. The architect in question says that, if it freezes, and the frost continues for some time, it is much firmer than when applied in the height of the summer. It is different when a sudden thaw sets in after a sharp frost.

Herr Krause had executed, during an alteration, a wall ten meters high and three meters wide, with three windows placed over each other, and joined to an old brick wall, when suddenly a thaw set in. The wall settled about six centimeters, and bulged out, so that he had great trouble in preventing it from collapsing. A sudden frost, however, made it firm again. After twenty years the wall is as good as ever, and there are no cracks. In that case, however, he had omitted to use unslaked lime, employing only hot water. The bricks had been stored in a heated room. Herr Krause has come to the conclusion that continued frost had the contrary effect upon mortar to what is generally supposed.

Herr A. Klemm, architect, of Stuttgart, expresses the same opinion in a communication which he sends to the *Deutsche Bauzeitung*, in which he says that in the winter of 1848–49 the works required for altering and fitting up the Prussian House of Deputies had to be carried out during a most severe frost. Notwithstanding this fact, the brickwork, executed with freshly slaked hydraulic lime, was found to be so firm in 1867, when alterations had to be made, that in some portions wedges had to be used in breaking it up. Herr Klemm adds that in his country (Wurtemberg) it is the general opinion that frost not only does not injure the brickwork, nor the plastering, but it improves its quality. The frost, however, should continue for some time. Herr Klemm expresses surprise that doubts could be entertained on the subject.

A Berlin firm of builders, Herren Ende & Bockmann, writing on the same subject to the *Deutsche Bauzeitung*, state that, in the autumn of 1864, they had orders to erect a warehouse, near Unter den Linden, during the winter. They were at first indisposed to undertake such work in that season; but circumstances demanded speed, and building operations were continued during the frost. They fully expected to find the brickwork faulty in places when the spring came, and had made up their minds that they would have to replace some of it. They were agreeably surprised to find the brickwork perfectly sound; in fact, it seemed to have set exceptionally well. Since that time the above Berlin firm of builders have not hesitated to continue bricklayer's work as long as they could; that is to say, as long as the water did not freeze on the bricks or the mortar in the pans. It should be added that the lime mortar used at Berlin is said to be of exceptionally good quality.—*The Builder.*

To Bleach Oils.

To bleach oils, 1 lb. permanganate of potash is dissolved in 3 gals. water, and to the deep violet solution 30 lb. of the oil to be bleached are gradually added, and the mass thoroughly stirred as often as possible during the next 48 hours. Then 2 gals. water and 5 lb. ordinary hydrochloric acid of about 19–21° Be. are added and incorporated with the mass by energetic stirring, whereupon it is left to stand for several days, when the sour water is siphoned off, and the remaining oil carefully washed with several hot waters, until every trace of acid is removed; finally, it is filtered through charcoal. Besides olive oil, linseed, poppy, palm, and fish oils may be treated in this way.

DESIGN FOR A SUMMER HOTEL.—GEORGE E. HARDING, ARCHITECT, NEW YORK.

A BUSINESS HOUSE AND RESIDENCE.

Brussels has long been regarded as one of the most beautiful cities of Europe. Her public edifices are grand and imposing, betokening the influence of an elevated architectural standard, the influence of which is also seen in many a private structure. We give an example of a recently erected combined business house and private residence, on the Boulevard Anspach, which is worthy of notice for its substantial as well as ornate character. Our engraving is from a drawing by von J. Engelhorn in *Architektonische Rundschau.*

The Chicago Manual Training School.

The Manual Training School is not conducted on a free principle. A tuition fee is charged for each student. With the exception of twenty pupils admitted this year, the fee is paid individually. These twenty were received upon recommendation of persons competent to judge of the merits of the boys, and their tuition is paid by members of the Commercial Club. Three years' study is necessary to complete the course. Of the seventy-two who entered the first junior class, twenty-seven remained to graduate. Ninety-eight entered the junior class last September. Four of this number have since dropped out. The boys who enter are from the ages of 14 to 15. None under 14 is admitted. No candidates are accepted who cannot pass a satisfactory examination in reading, writing, spelling, geography, English composition, and arithmetic. A boy must have, too, a certificate of good moral character from some responsible person. The penalty of any impropriety in conduct is dismissal. Latin, French, descriptive geometry, and higher algebra are taught. The first manual work a boy does when he begins the course is in the wood room. There he learns various branches of the carpenter's trade, joinery, wood turning, and pattern making. He learns not only the use of tools, but their proper care. Each boy furnishes his own kit and has his own tool drawer. Extra tools are supplied if needed, but the student is made responsible for them. Recently the boys were at work on picture frames, tables, hammer handles, and the wood parts of other tools. In the second year the pupil is put in the foundry and blacksmith shop. No better hammers and screw drivers can be found in Chicago than are made by the lads. The most expert workman can turn out no smoother pieces of casting than some they show. In the senior year the students get into the machine shop. By that time they are able to make and put together a steam engine. Three were constructed in the school last year, and three will be made this.

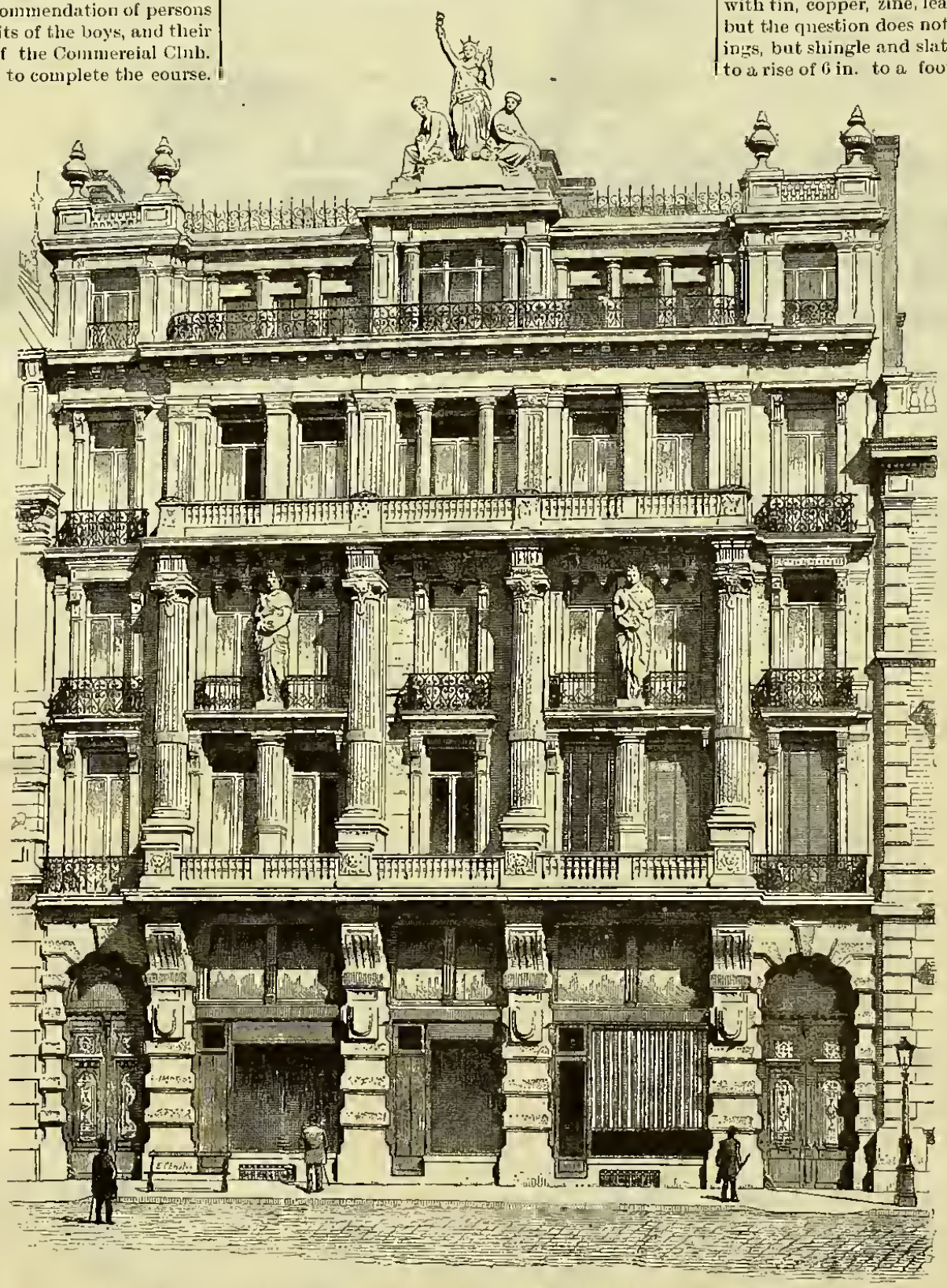
The work of making an engine begins in the drawing room. Every stroke of the pencil is made by actual measurement, even to the drawing of a bolt head. The scholars draw the plans for the patterns, and then make the patterns. In the machine shop the busts of Stephenson, the engineer, and James Watt, begrimed with the soot of labor, look down upon the busy workers. The boys will soon try their skill in constructing an ornamental iron gate for the Michigan Avenue entrance of the building, for which drawings are now being made in the school.

The wood room contains thirty-nine cabinet makers' benches, twenty-four speed lathes, a circular saw, scroll saw, a boring machine, planer, grindstone, shoot plane, bench lathe, and general tools sufficient for the use of ninety-six boys. In the foundry are two furnaces, crucibles, troughs, flasks, trowels, rammers, sieves, and other apparatus, so that sixty-six boys can work at once. In the forge room they can get smut on their faces together, too, at the same time. There are twenty-four forges, twenty-three anvils, one emery wheel, one shears, three vises, one blower, two exhaust fans, tongs, sledges, hammers, fullers, and all the other tools required to transform clean skinned youths into the sootiest of blacksmiths.

The machine shop has seven 12 inch, 6 foot bed engine lathes. There is also an engine lathe with a 16 inch swing and 8 foot bed. There are two speed lathes, a planer with 6 foot bed, shaper, drill, grindstone, fifteen benches, fifteen vises, chucks, boring bars, taps, dies, chisels, files, and other tools—enough for thirty-two amateur machinists.

A visitor can pass through every room in the building and find no idlers. All are absorbed in the work they have in hand, and scarcely raise their eyes. "The fact that their attention is so riveted on what they are doing," said Mr. Belfield, "shows the cultivation of a most important faculty of the mind—the power of concentration. This attention, too, is not enforced, but is voluntary and unremitting. The boy who goes through a three years' course here not only attains intellectual development, but he gains comprehension of essential branches of knowledge far superior to those of the high school pupil. The training school is by no means a manufacturing establishment. The product of the school is not intended to be perfect pieces of machinery and polished furniture, but polished, perfect boys. It practically demonstrates, also, the dignity of labor. So thorough is the training here, that graduates who desire to pursue a higher grade of education are admitted, on recommendation of the director, without examination and free of conditions to several of the colleges and universities of mechanics and engineering in the United States.

"Prof. R. H. Thurston of Sibley College, Cornell University, wrote to me recently that if we could send him as good specimens of boy development as we have already forwarded, they'd be glad to get them. The professor of mechanical engineering at Perdue University, Lafayette, Ind., also wrote to me about one of our graduates who is there: 'If you can send us any more boys like this one,' he says, 'we shall be mighty glad to get them.' I believe we have struck the key note for the practical education of boys in the system of the Manual Training School. It embodies at once the education of the hand to skill and the brain to directive intelligence. There come the boys down to lunch. Their dining room is in the basement. They have made all the tables themselves."



A RESIDENCE AND BUSINESS HOUSE, BOULEVARD ANSPACH, BRUSSELS.

Water-Tight Roofs.

The question is often asked, What is the proper pitch for a roof to shed water and snow? In discussing the question we need only go into the merits of the case so far as it relates to a condition of flatness or it approaches a level. Generally builders claim that less than what is known as a fifth pitch cannot be successfully shingled or slated with any guarantee of safety. As is well known, any pitch or incline may be covered with tin, copper, zinc, lead, or iron, and be made tight, but the question does not affect the use of metal coverings, but shingle and slate. One-quarter pitch is equal to a rise of 6 in. to a foot run, and one-fifth pitch is equal to 4⅞ in. rise to one foot run. The first may be considered entirely safe for slate, and the second for shingle. Upon a comparison of a large number of roofs in different parts of the globe, a roof of one-quarter pitch is the correct one for the climate of the Western and Northwestern States. From the fact that slate cannot be as closely nailed as shingle, for fear of breakage, the joints are left more or less open, and therefore they must be laid steeper than shingle. A good rule to be observed in laying a shingle roof is to give the rafters a sufficient pitch, so that the butt of a shingle will be at least 6 in. below the thin edge. By experiment it will be observed that in a quarter pitch roof the butt is 7¼ in. below the thin edge for a standard 16 in. shingle, and 6 in. in a one-fifth pitch. The same rule may be observed in a slate roof, only the pitch, as we have said, should be not less than quarter.

The *pitch* is the distance across the building from eaves to eaves, divided into as many parts as desired; when divided into four parts, the roof is termed ¼ pitch, as the height from the level of the eaves to the apex of the roof should be equal to ¼ of the distance from eaves to eaves. The manner of obtaining ⅓ pitch is the same, except the subdivision should be in five equal parts.

The cause of leaky flat shingle roofs is the backing up of the rain or moisture beyond the thin edge of the shingle, under the butts of the next uppermost; that is, supposing that the shingles are well laid, lapped and nailed. Another feature connected with flat or comparatively flat shingle roofs must be considered, and that is, the inability of the shingle on account of its flatness to quickly shed rain and moisture and to become dry within a reasonably short period of time. This state of continuous dampness, except when directly affected by the sun's rays, generates seeds of dry rot that eventually sap the life of the wood and soon end the usefulness and substantiality of the shingle.—*Hill's Builder.*

Old Iron.

A most remarkable feature in trade just now is the large export of old iron to the United States. In January, two years ago, we sent 856 tons of old iron to the United States; in January, last year, we sent 3,271 tons; but last month we sent 21,667 tons of old iron to the United States. This enormous increase in the export of "scrap" iron means much; it means that the United States is using all its own and has to buy large additional quantities, and it indicates the fact that the users of iron here will have to use more pig iron in place of the scrap.—*Newcastle Chronicle.*

AN ENGLISH HOME.

We give an elevation from the *Building News* of a house at West Wickham, built chiefly of brick, and at an estimated cost of ten thousand dollars. There are several features in this elevation that may prove interesting and suggestive to those who are looking for house plans.

A ONE THOUSAND DOLLAR COTTAGE.

DESIGNED BY B. J. SCHWEITZER, ARCHITECT.

SPECIFICATION.

MASON WORK.

Cellar.—To be excavated under the entire house, 3 feet deep. Build a stone wall, 18 in. thick, up to the surface level, laid in good mortar. Above the surface build an 8 in. hard brick wall, 3 ft. 6 in. high, all laid in good mortar. Point up the stone and brick walls and leave complete for the frame.

Piers.—Build three brick piers in the cellar to support the girders. Also build piers of brick for the front and rear stoops.

Chimneys.—Build an 8 in. flue chimney, of hard bricks, laid in good mortar, as indicated on plan. Thoroughly strike all joints with cement complete. Top out the chimney as shown, and finish it with an iron cap. Provide all rooms with stove pipe holes and thimbles.

Lathing and Plastering.—Lath all walls and ceilings on first floor with spruce lath, and plaster two good coats of mortar and hard finish complete.

Privy.—Build vault as required.

CARPENTER WORK.

From front to rear, put in girders 4 in. × 8 in. of hemlock; sills, 4 in. × 6 in., halved at all angles; corner posts, 4 in. × 6 in., 13 ft. long; interties, 4 in. × 6 in., mortised into corner posts; plate, 4 in. × 4 in.; first and second floor beams, 2 in. × 8 in., placed 16 in. from centers; rafters, 2 in. × 6 in., placed 20 in. from centers; wall strips, 2 in. × 4 in., placed 16 in. from centers; sills for stoop, 3 in. × 4 in., and beams 3 in. × 4 in. All timber to be of the best quality hemlock. Bridge the floors and spike together the entire frame.

Sheathing.—Cover the house from sill to plate with hemlock boards, well nailed.

Paper.—Over the rough boards put on resin sized sheathing paper, and lap all joints.

Siding.—Cover the house from sill to plate with narrow lap siding, free from bad knots and sap.

Outside Trim, all of White Pine.—Water table, 1¼ in. rabbeted; corner boards, 1¼ × 5 in., with angle beads; bands, 1¼ in. × 6 in., rabbeted; cornice, 7 in.; moulded verge boards, 1¼ in. × 8 in. chamfered. Bay trim, 1¼ in. stuff, panels sunk with flush mouldings. Shingle the gables with regular 6 in. sawed white pine shingles, 6 in. to the weather. Shingle all the roofs with merchantable white pine shingles, laid 5½ in. to the weather over shingle lath.

Gutters.—Build ample troughs at the eaves, and tin them with best I. C. tin.

Stoop.—Posts 6 in. chamfered, cross pieces same, floors covered with 1¼ in. white pine, with white lead in the grooves. Steps are as shown, of best white pine, risers ⅞ in. and treads 1¼ in.

Leaders.—Provide 3 in. leaders for the house from the gutters to the ground.

Windows.—All sash 1½ in. thick, glazed with good American sheet glass. The large panes are to be double thick. Furnish all with the "Ives" sash fasteners, and furnish all with pulleys, weights, and cord.

Blinds.—All windows are to have outside blinds 1¼ in thick, hung on N. Y. wrought iron hinges in pairs, and all are to have fasteners.

Doors.—Outside doors 1¾ in. flush moulded panels, and transom over the top. Furnish with heavy mortise lock, black knob and good furniture. All other doors, except closet doors, 1½ in. thick, four paneled, flush moulded. All closet doors 1¼ in., four paneled. Furnish all 1½ in. doors with mortise locks, and all 1¼ in. doors with rim locks. All are to be hung on loose joint butts. Saddles are to be of hardwood, jambs ⅞ in. with stop beads. All doors are to be of best white pine.

Floors.—Cover all floors with 4½ in. × ⅞ in. white pine flooring, in usual manner.

Inside.—Trim all plain with turned corner block. Windows to have stools and aprons. Base, 6 in., beveled top and beaded sides. All of good white pine.

Closet.—Provide the kitchen closet with five rows of shelves.

Stairs.—All as per plan, risers ⅞ in., strings 1¼ in., and treads 1¼ in., all good white pine, thoroughly wedged and glued together in the best manner.

Mantel Shelf and Brackets.—The parlor or living room is to have a neat 1¼ in. beaded shelf, supported on neat wooden brackets with beaded face. All not to cost more than $3 complete.

Privy.—Size to be 4 ft. 6 in. × 4 ft. 6 in., built in same manner as house. Provide seats, stench pipe, and cleaning trap, also door and small window, all complete.

Painting.—Paint all metal work with Brandon metallic paint, two coats. Paint all outside woodwork, except shingles on roof, two best coats of white lead in L. I. oil. Paint or stain the inside, and varnish with best No. 2 "Elastica" finishes all complete, two coats.

Finally.—The entire work must be completed in a faithful and workmanlike manner. All materials to be of good merchantable quality.

A LAND slide in the mountains above Chico, Cal., the other day laid bare broad streaks of white quartz which carries, apparently, a very large percentage of gold.

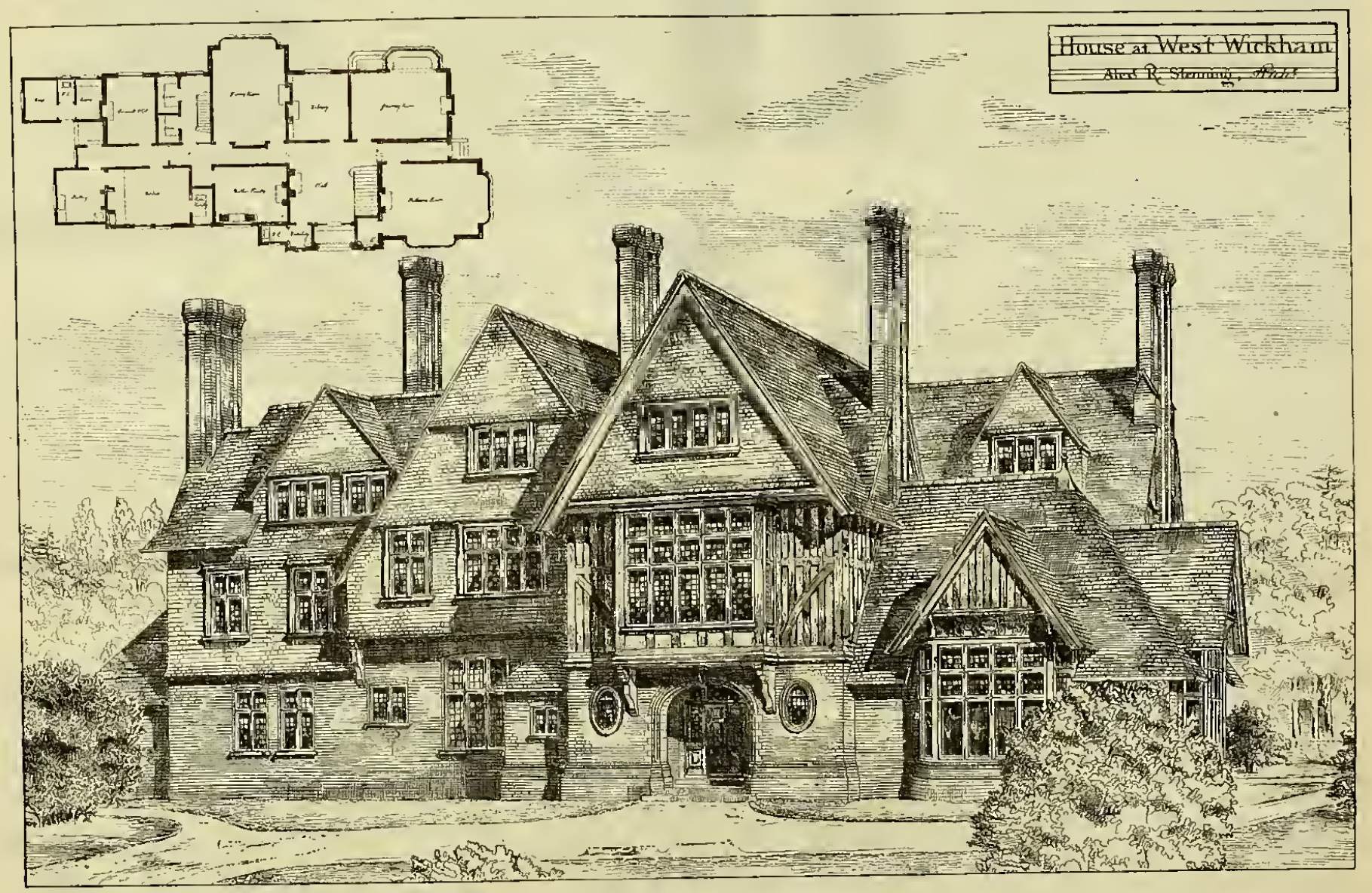
A Quick Lawn.

Mr. William Saunders, of the department of agriculture, at Washington, recommends timothy for making a quick growing green covering for a lawn.

As is well known, the finer grasses, like June grass, *poa pratenses*, and fine bent grass, *agrostis vulgaris*, are very slow in making a firm, thick sod, and are often badly held back while young by rank growing weeds. Some who want a green covering for newly made lawns as early as possible sow some oats or millet, keeping them closely cut the first summer, but these grasses, though better than nothing, and better than weeds, are too coarse and quite unlike an ideal lawn grass. Timothy, while not fit for a permanent lawn grass, is quick to grow and of good color the first year, and makes a far better appearance than the coarser grains, like oats or millet. It dies in a few years from the close clipping it gets, leaving the lawn in possession of its permanent occupants.—*N. E. Farmer.*

THE CATHEDRAL, MEXICO.

In the city of Mexico, all the main thoroughfares converge on the great Plaza de Armas, or Main Square. Most of the public buildings are here located. On the north side of the square stands the magnificent cathedral, which occupies the ancient site of the heathen Aztec temple or pyramid. The cathedral was begun in 1573, and completed by the Spaniards in 1657, at an immense cost, the expense of the walls alone being two millions of dollars. The building is in the form of a Greek cross, 426 ft. long and 203 ft. wide, with two naves and three aisles, twenty side chapels, and a magnificent altar supported by marble columns and surrounded by a tumbago ovallos balustrade, with sixty-two statues of the same, composed of rich gold, silver, and copper alloy, serving as candelabra. There is an elaborately carved chair, also inclosed by tumbago railings, weighing twenty-six tons, and valued at one million five hundred thousand dollars. The Doric style prevails in the interior, Renaissance on the exterior, which is adorned by a fine dome and two open towers 218 ft. high. Our engraving, from *La Ilustracion Espanola*, presents an interior view of the great nave, and gives an idea of the magnificent architecture of this remarkable edifice.



AN ENGLISH COUNTRY HOUSE.

A NEW vermin exterminator is prepared by saturating wheat or other grain with a solution of strychnia in water, the grain afterward being coated with a solution of simple sirup and arsenic, a small quantity of oil of rhodium being afterward applied. It is doubtful whether this poisoned grain could be legally sold in this country; and whether or no, it should be carefully avoided.

Heating by the Combination of Warm Air and Steam.

The problem of successfully heating large buildings such as churches, chapels, public halls, and other buildings of the same class, is one of great interest and importance, but often of much difficulty. With the rapid changes in temperature peculiar to our climate, it is not easy to provide a system which, while being economical, shall allow of a building being maintained at the exact degree of heat required. The reason for this is not difficult to understand when it is considered that under the usual systems of heating it requires some considerable time for the building to become warm, and secondly, that it demands the outlay of the full capacity of the boiler, whether the thermometer stands at 60° or zero. The immediate result of a cold wave in such cases is that, in order to obtain something like comfort, and to heat the building as quickly as possible, the furnace is raised to a red heat. The effect of this is obvious to any person acquainted with heaters; the joints become loose and the products of combustion escape into the room, rendering the atmosphere stifling with dust and gas, and causing much discomfort to the occupants.

A system was much needed which, succinctly stated, should be powerful enough to warm a large building quickly and economically, and at the same time give facilities for rapidly reducing it as might be required. Such a system is that of the firm of Wier & Nixon, of No. 1410 North Street, Philadelphia, Pa. Here we have a heater which gives two separate means of heating—one by hot air and the other by steam. The effect is three-fold in its advantages; first, it permits of very rapid warming; secondly, it allows of the hot air being used by itself when the weather is moderately warm, and is thus very economical; and lastly, it utilizes the whole of the heat from the fuel, and substantially prevents all waste.

The apparatus are made in six sizes, both brick set and portable. In the back half of the fire chamber is a water back, against which the fire rests, and just above, standing upon two water legs across the center of the fire and in the middle of the combustion chamber, is a cylindrical boiler, and above it a steam drum. All these parts are incased by a steel dome, and are devoted entirely to the production of steam. On the outside of the dome, in conjunction with the fire cylinder, the hot air is generated. Check draughts are provided, and are worked automatically by boiler pressure. The whole construction is eminently well calculated to prevent waste and give great power.

The manufacturers have by this system successfully dealt with cases of extreme difficulty, and have rendered many buildings warm and comfortable which under all systems previously tried were cold and cheerless. They offer every facility for the examination of their system, and those who need heaters will do well to avail themselves of it.

IMPROVED PEDESTAL JOINTER.

The buzz planer or jointer is a machine so widely known and universally employed that a description of its many advantages and uses is unnecessary: Certain it is that it forms one of the most important factors in a woodworking establishment, and on account of the variety of work that may be done on it, has justly attained the position of a standard tool, which will always remain a great favorite among operators.

The machine illustrated in the annexed engraving is one of entirely new design, by the well known firm of Goodell & Waters, of Philadelphia. It has been very carefully contrived, with the view of combining in construction the advantages of simplicity, accuracy, and economy, and has the special improvement in the method of raising and lowering the tables by link motion, to adjust for different thicknesses of cut, which is considered by the manufacturers the best in use. Then there is little or no chance for oil or grit to wear the links and the joints are close and accurately fitted, so that it is almost impossible for any foreign matter to get in those parts. When filing or adjusting the knives, one of the tables may be raised up entirely clear of the cutter head, leaving free access for the operator to accomplish his work.

These machines are made in four sizes, to work twelve, sixteen, twenty, and twenty-four inches wide respectively, as may be required. Every detail in construction receives particular attention, and a thoroughly first class tool is the result. For prices and further particulars, we refer our readers to the manufacturers, Goodell & Waters, Philadelphia, Pa.

THE WAINWRIGHT EXHAUST FEED WATER HEATERS.

Below we give a brief description of the Wainwright exhaust feed water heaters.

In Fig. 1 the water enters the heater through left-hand opening, fills the settling chamber and shell, and is there heated to a temperature of from 200 degrees to 210 degrees by contact with the corrugated copper tubes filled with steam, and escapes through upper right-hand opening. The exhaust enters at the base, thence through the corrugated tubes, and out at the top.

In heater Fig. 2, the water enters at lower left-hand inlet, and, after filling settling chamber, passes up through pipe into the corrugated copper tubes, acquiring a complete circulation by flowing up and down same before passing to boiler through upper right-hand outlet. This complete circulation of the water is effected by return bend castings in connection with the tube plates, thus forcing the water to pass through each tube separately. The exhaust enters through top of heater, surrounds the tubes filled with water, passing out at base, or *vice versa*.

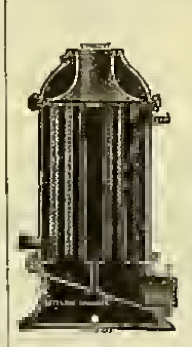


Fig. 1.

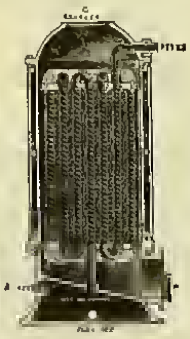


Fig. 2.

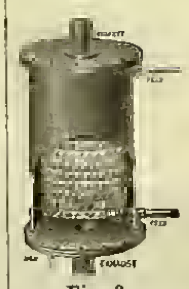


Fig. 3.

Fig. 4.

Fig. 3 shows another style of heater, with coil of corrugated copper tubing. The water is fed into the coil at lower right-hand inlet, and passes to boiler through upper right-hand outlet. The exhaust enters at the bottom of the heater, and escapes through the top, or *vice versa*.

In Fig. 4 the principle is the same as in Fig. 3, a settling chamber being added to receive all mud and sediment that may be in suspension in the water, and which may be blown out. The water enters at lower left-hand opening, fills the settling chamber, then passes up through corrugated copper coil, and is fed to boiler through upper right-hand outlet. The exhaust enters shell at right-hand side in the base, surrounds the corrugated coil, and escapes through cover, or *vice versa*. The superiority of corrugated tubing over plain is clearly shown in these heaters, increased heating surface being gained, and all annoyance from expansion and contraction being removed, it being absorbed in the corrugations, and thus danger from leakage is obviated.

The Wainwright Manufacturing Co., 65 and 67 Oliver Street, Boston, Mass., manufacture these goods, among their other specialties, their selling agent in this city being F. B. Aspinwall, at No. 93 Liberty Street. In Philadelphia and Pittsburg, their agents are Fairbanks & Co.

Artistic Coloring of Houses.

Among the beautiful houses which have been built during the past season at our fashionable summer resorts, that of Miss Jones, at Newport, R. I., which was designed by Peabody & Stearns, of Boston, attracts a great deal of notice.

The first story is of gray stone, and on the suggestion of Mr. Coleman (the celebrated artist), the shingled walls and roof are stained with No. 16 Dexter Brothers' English Shingle Stain," which is a perfect imitation of an old, weather-beaten shingle.

The effect of the whole house is charming. It has a look of age and comfort. It is rare that a house in its first season looks as if it had lived a long while; but the color and the grace of its architecture gives this house the whole appearance of an old Newport residence. At Bar Harbor, Mt. Desert, Mr. William Ralph Emerson has designed a club house for the fortunate summer residents, and it is now nearing completion. The design is novel, and so full of artistic feeling that any one would know that it was the work of an artist, even if Mr. Emerson's name had not been mentioned.

The outside walls are stained with this same stain to represent the weather beaten shingle, while the roof is stained with a moss green stain. The trimmings and window frames are painted an ivory white.

During the past few years the whole coloring of the outside of houses has changed.

The old idea that shingles must be painted so that the grain of the wood could not be seen gave no opportunity to the architect to make an artistic effect of color. Indeed, a great deal of the staining of shingles has been disappointing because poor, cheap stains containing benzine or water have been used. These cheap stains will wash off and streak the other parts of a house, or the colors will fade out.

There is no economy in using cheap stains, and the architects are specifying Dexter's English shingle stains, as these stains are made of the very best materials.

Acoustic Hints.

In regard to the acoustic properties of the building at North Clarendon, Pa., referred to by a correspondent, I would say:

1st. The conditions necessary for a full reply are not given.

2d. It is necessary to know the plan of the floor joists in the ceiling.

3d. Of what material are the side walls composed?

4th. When the room is comparatively vacant, can echoes be heard of sounds delivered from either end of the room? But I will answer provisionally.

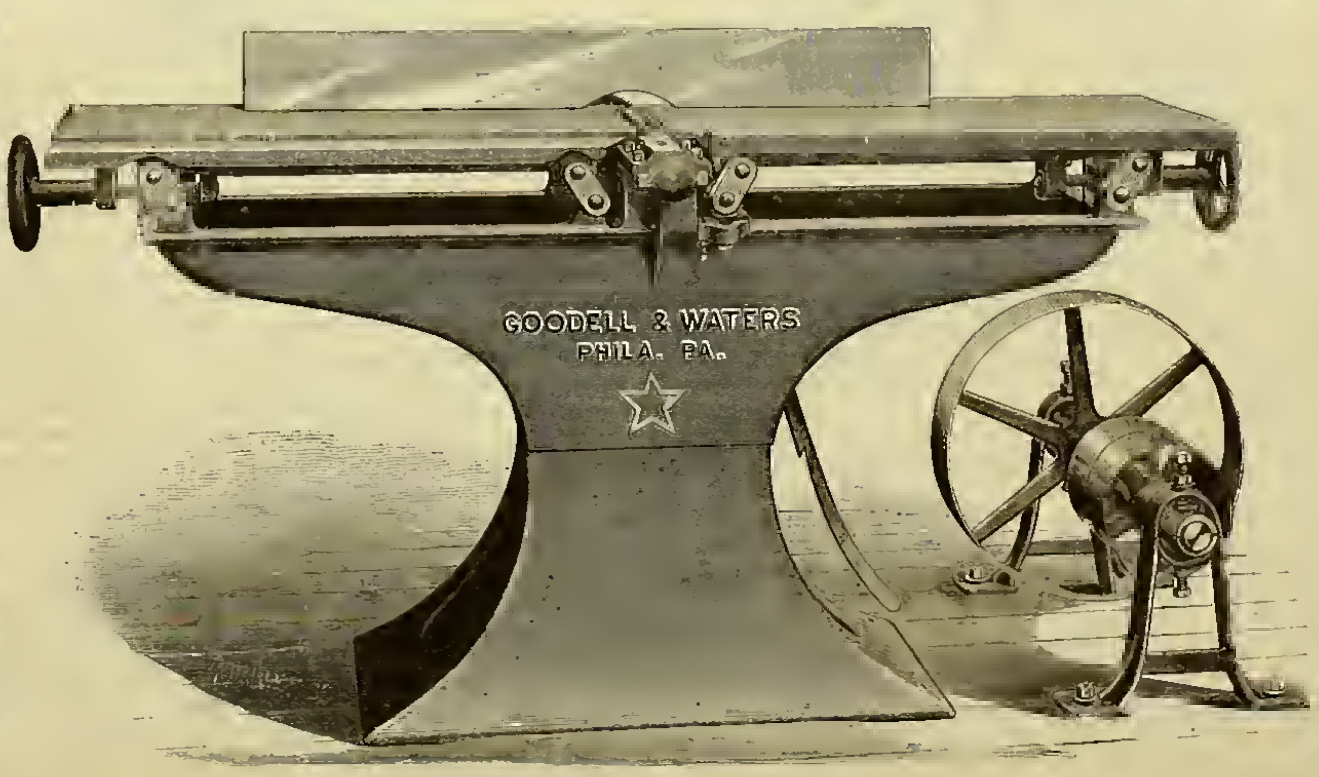
The building is 120 feet long by 42 feet wide, height not given. If speaking cannot be heard distinctly by a person in the back part of the room, it may be owing to the returned reflection of the sound waves from the cross joists or stringers, as some one has said to him.

Wires will be of no avail unless the room is properly ceiled. They cannot destroy the interference of sound waves from the reflection of the beams. The principle upon which the action of the wires is based is the phenomena of interference, by which unequal, non coexistent vibrations are modified and harmonized. It is possible to add one sound to that of another in such a series of vibrations as to produce silence. It is also possible to have these vibrations so intercepted as to clear the sounds transmitted of their confused murmurs, and it is this result the stringing of wires will produce when properly arranged.

But from the indistinctness of hearing complained of, I think what is needed is more resonance. This can be accomplished by ceiling the exposed joists with accurately tongued matched boards of seasoned pine, glued in the tongue and groove. They should be thin sheeting and narrow. A plastered ceiling would produce positively bad results.

The walls of the room ought not to be plastered. Pine sheeting is good, Portland and Rosendale cement better still. Fear of too much resonance need not be felt, because a great crowd of people will subdue all echoes if the seats gradually rise from front to rear.

K.



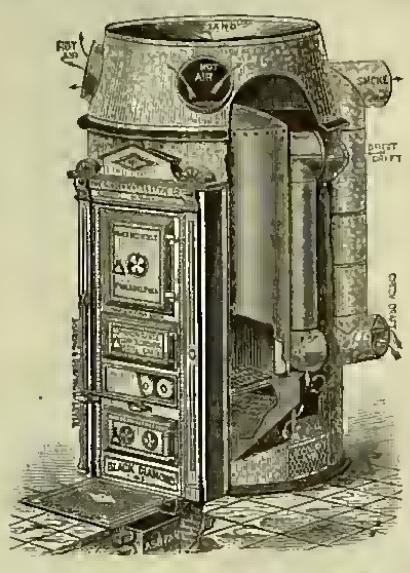
IMPROVED PEDESTAL JOINTER.

IMPROVED FURNACE.

Inventions are constantly being made which contribute to the convenience and comfort of the modern dwelling. Among the more recent ones may be mentioned the Black Diamond Furnace, as patented and manufactured by the Schoen Heater and Stove Co., of 13 North 11th Street, Philadelphia, Pa.

The general construction of these furnaces embodies all the principles of successful warm air heating. They have self-cleaning radiators, with direct and indirect draught, and being made of steel plate, with riveted joints, they are perfectly gas tight.

The grate is of peculiar construction, consisting of



THE BLACK DIAMOND FURNACE.

square steel bars passing through a series of pointed teeth of cast iron. These bars are operated by one lever, which controls the shake and dump of the fire. The grate surface is reversible, and all parts of the grate interchangeable, and require no fitting. No bolts or screws are used in the entire arrangement.

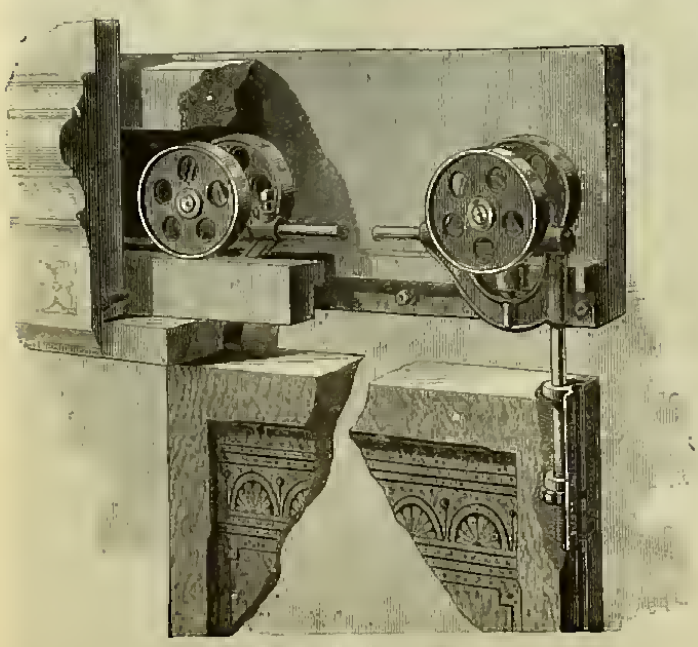
The self-cleaning ash pit is the most important improvement, and consists of an inclined bottom, which throws the ashes and clinkers forward into a pan which is placed in front of the furnace, below the floor level.

The considerable advantages and conveniences of this arrangement may be summed up as follows: Greater radiating surface is provided, the heat of the underneath side of the fire being utilized; a sure prevention from fire caused by hot ashes dropping from the furnace is effected; a perfect draught is insured by always having a clear grate surface, and generally there is a great saving of labor, dirt, and annoyance.

SLIDING DOOR HANGERS.

The inconvenience arising from badly hung sliding doors is often so great that many builders will employ the ordinary hinged door in preference, notwithstanding the considerable space in the room which they render useless. Foremost among these disadvantages are the cutting of the carpet, a projecting floor rail, and the manner in which the door is liable to stick, especially in the case of the heavier ones

All these objections may be easily overcome by suspending the door on an efficient hanger. Of these devices a large variety, of more or less merit, are before



SLIDING DOOR HANGER.

the public. Of these not one exceeds in usefulness those made by E. C. Stearns & Co., of Syracuse, N. Y., under the title of "Warner's patent door hangers." They are simple in construction, economical, and are largely used throughout the country. The accompanying cut illustrates the general construction of the hanger, which is well designed to permit of easy adjustment by means of ratchet nuts, lowering or raising the door when necessitated by any settlement of the building, to clear a carpet, or for other purposes. The hangers are entirely hidden from view, and, being thoroughly made and lined with anti-friction metal, they are noiseless, and, what is of great importance, balance a door so accurately that it may be moved with the greatest ease.

The Cincinnati (O.) Corrugating Co.

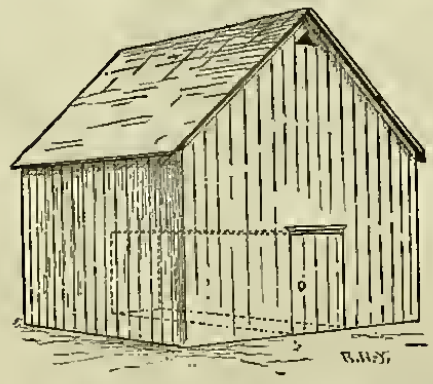
have for years used as their brand the word "Superior," and claim they bend every energy to the maintenance of the verity of their brand.

This is done by the closest attention to the minutest details—every sheet of iron being carefully inspected before painting, when even the smallest "pin-hole" compels rejection; by using the most improved machinery, all driven by steam power; by using none but the best metallic paint, thoroughly reground in pure linseed oil; by carrying the largest stocks of sheet iron in the United States, thus filling all orders promptly; by furnishing inquirers at once with detailed estimates.

They are abreast with the march of improvement, and only solicit a trial when you are in need of anything in their line.

AN ICE HOUSE.

The building is 12 x 16 feet on the ground, with 12 foot posts and studding 2 x 6 inches, 12 feet long, and covered with novelty boards, lined with hemlock, and the intermediate space filled with sawdust from the ground to nearly the top of the rafters. Through the center, the 12 foot way, I built a passage four feet wide, six feet high, with a partition on each side of four inch joists, covered and filled with sawdust, with three inch plank, four feet long across the top, for flooring. The door opening into the room is six inches thick, packed with sawdust and built like a refrigerator door, fitting tightly. In the rear of the passage I have a tank built into the ground for holding water and cans; immediately over the door an aperture, 2 x 4 inches, opens from the room into a ventilator of the same size, pass-



ing up along the inside of the building and opening at a small open window nearly at the peak of the roof, which keeps the room free from all foul and disagreeable odors This arrangement leaves for ice a space 6 x 12 feet on each side of the room, and six feet high, above which the whole building is packed as full as it can be conveniently, and covered with sawdust or hay. The house is filled at the rear. By keeping the door closed as much as possible, the temperature within the room can be kept as low as 48 all the time, and as no warm air gets to the water, it seldom has to be changed. The ice need not be disturbed until the middle of July, and then not much is wasted at a time. Meat, butter and eggs can be placed upon a shelf out of the way and kept as well as in a refrigerator.—*Rural New-Yorker.*

Plans and Specifications.

Should any of our readers desire to procure plans and specifications for buildings, whether churches, schools, dwellings stores, carriage houses, barns, etc.; or if they desire plans made for alterations, enlargements, or additions of any kind, to existing buildings; erection of porches, bay windows, extensions, wings, etc.; they are reminded that all business of the kind will receive prompt attention at this office, on very moderate terms. Address Munn & Co., 361 Broadway, office of SCIENTIFIC AMERICAN, Architects and Builders Edition.

IMPROVED TENT.

The accompanying engraving illustrates a tent which is the invention of Mr. Merritt P. McKoon, of El Cajon, San Diego Co., California. As the doorway is placed at the center of one side, the trunks or cots can be placed crosswise of the tent, and near the ends and end poles, thereby economizing room in the center of the tent, where it is most desired. This middle room can thus be occupied by table, chest, chairs, etc. The half diamond shaped ends form valuable "stow-away" places, or they can be curtained to form separate apartments when necessary. The center or point seam on each end is rope bound and brass linked over end pole iron spikes at the top of the tent, while the lower end of this rope is left loose for about 20 inches beyond the tent, to bracket over tent pin tightly or loosely at will, as dry or wet weather requires. This anchors the tent firmly and solidly, and insures its standing during the most severe gale. The angular roofing or awning over the doorway is of great value, as either one or both of the door flaps can be attached to the sides of the awning at pleasure, so as to obstruct the entrance of sun, rain, or wind when desired. A most agreeable shelter is provided. The tent presents a neat and most attractive appearance, and is as well

adapted for lawn or sea shore use as for actual hard camping service.

HOT WATER APPARATUS FOR WARMING DWELLINGS.

In this climate there are few subjects of more importance than the proper method of warming dwellings, and there is none that receives so little attention from those most directly interested, viz., those occupy the house.

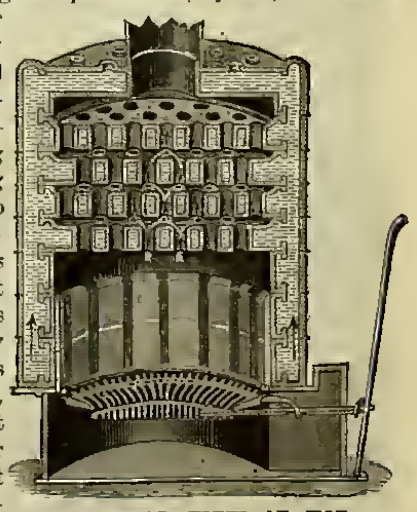
Hot water is now recognized as one of the best methods of warming dwellings, and, in the opinion of many, possesses a number of advantages over both steam and furnace. Among the apparatus for heating with hot water, the Gurney Hot Water Heater, which we illustrate in this connection, is justly considered one of the best. Originally manufactured and introduced in Canada, it has lately, under the energetic management of John A. Fish, been widely introduced into this country, and is meeting with a ready sale, and gives general satisfaction wherever used.

By reference to the engraving, showing sectional view, it will be seen that this heater has several novel features, and among these are the improved shaking and sliding grate, ironstone lining to fire pot, open water way, combustion chamber, and quincunx fire tubes.

The advantages may be briefly stated as follows: Hot water radiators will heat with a low fire, while with steam radiators no heat is given off until steam is generated, the amount of fuel consumed in first raising steam being practically wasted as far as heating the building is concerned; a saving of from fifteen to twenty-five per cent. in consumption of fuel; equality of temperature throughout all parts of the building; simplicity of the apparatus, an ordinary domestic being competent to take charge of it; durability—there being no pressure or strain on it, there is no wear or tear; the apparatus being open to the atmosphere, is perfectly safe, and entirely dispenses with the use of safety valves.

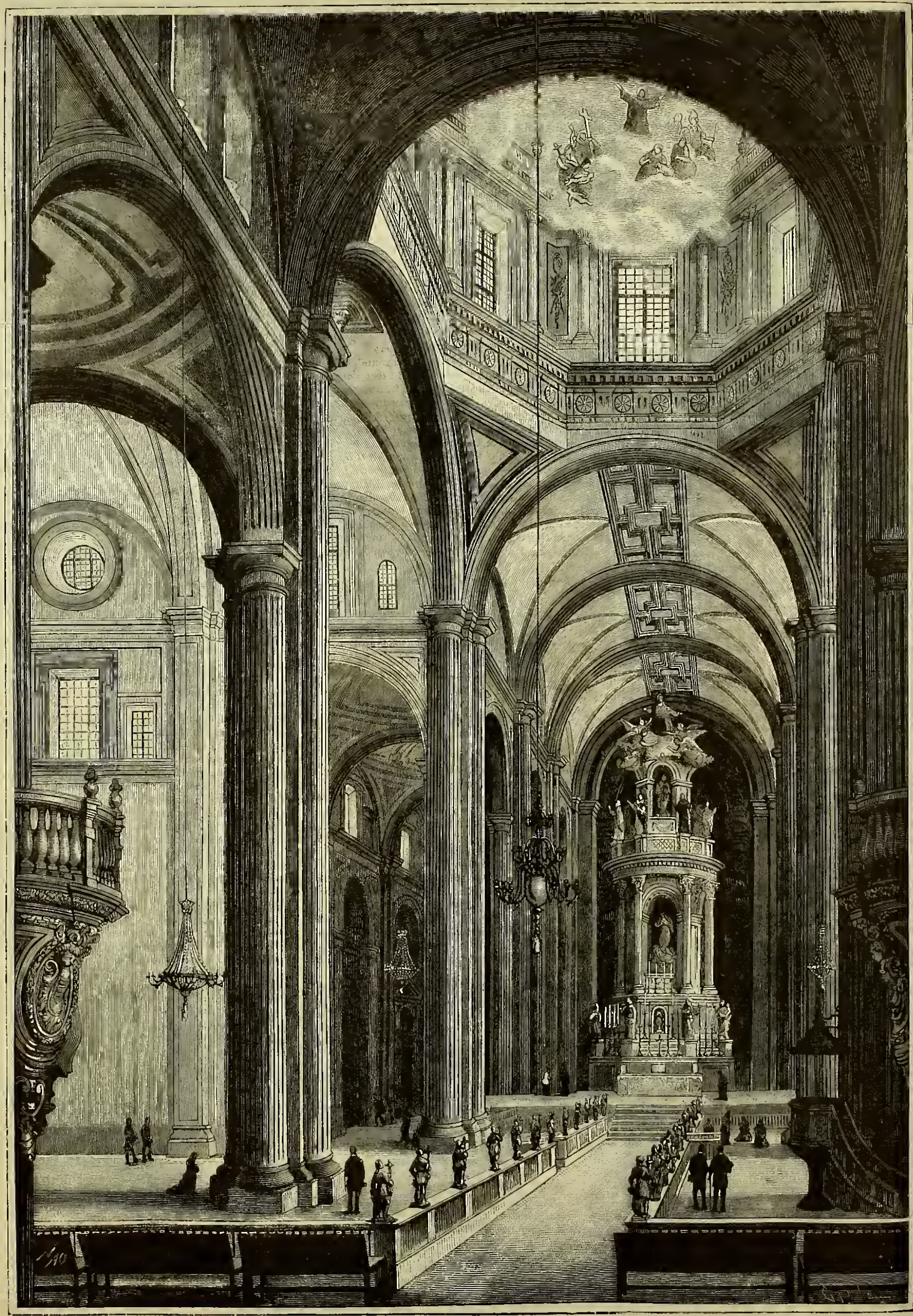
Then in addition the apparatus is easily cleaned both vertically and horizontally; and as the outside cannot be heated to more than 190°, there is no likelihood of fire taking place from the contact or proximity of combustible materials with the exterior.

Any time during the past twenty years, the advantages of hot water have been readily admitted on all hands, the practical method of application being the only thing questioned. So general is this admission of its superiority, that in greenhouses its use is practically universal, as it is recognized that, while steam heat is greatly inferior to hot water, hot air is greatly destructive to plant life. These facts should be full of significance to people of intelligence, familiar with the laws of health, and anxious to conform thereto.



SECTIONAL VIEW OF HOT WATER HEATER.

The Gurney Hot Water Heater, whose general offices are at 239 Franklin St., Boston, is recognized as one of the best heaters in the field, and those of our readers who are interested should write to John A. Fish, Esq., the managing director, for illustrated catalogue fully explaining this system.



THE GREAT NAVE, CATHEDRAL OF MEXICO.—[From a Photograph.]

[For description see page 91.]

SCIENTIFIC AMERICAN

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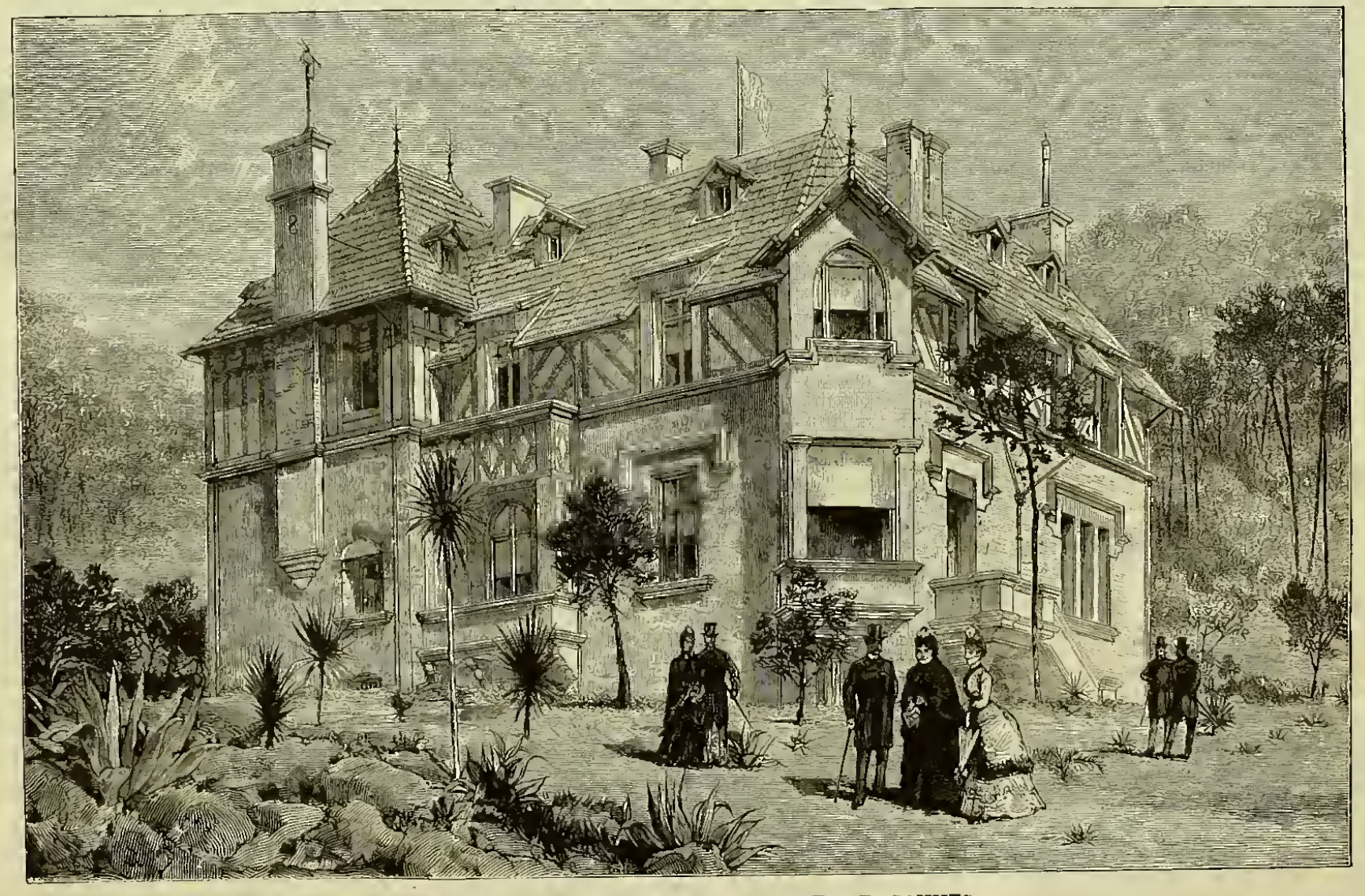
THE QUEEN OF ENGLAND'S COTTAGE AT CANNES.

Her Majesty, with Princess Beatrice and Prince Henry of Battenberg, lately passed four or five days at Cannes. Her Majesty resides at the Villa Edelweiss, which has been placed at her disposal by Mr. Savile. Cannes has been frequently described, and recent letters have given some account of its social life among the numerous English visitors, including many persons of rank and fashion, and of the visit of the Prince of Wales to that place, which, happily, was spared all serious injury from the earthquake that disturbed and damaged several other towns of the Riviera. It is a town of 15,000 people, including the average number of visitors, 120 miles from Marseilles, 79 from Toulon, and 20 from Nice. Its situation, extending four or five miles along the shore of the Gulf of Jouan, Cape Croisette, and the Gulf of Napoule, affords a variety of delightful sea views, and the valley of Le Cannet, and other sheltered parts, enjoy complete protection from cold winds, at least from the northerly and northeasterly winds, being shielded by the Esterel and the Maritime Alps, the hills rising there, on three sides, 800 ft., 1,500 ft., and 2,000 ft. in height. The latitude is nearly the same as that of Florence, and the sun has great power even in winter, the average temperature at that season being ten degrees higher than in England, with no fog or damp, and with little rain. The air, however, is bracing and stimulating, and proves beneficial to many invalids. Until 1834, Cannes was little known to foreigners, but in that year Lord Brougham, then our lord chancellor and a personage of great political importance, chose it for his annual winter residence, and his example was largely followed, and there he died, in 1868, ninety years of age. The accidental death, as it must be considered, of the late Duke of Albany at Cannes, on March 28, 1884, has rendered the place more interesting to the English royal family, and to all who cherish that esteem for the memory of the lamented prince which is now perpetuated by the erection of St. George's English Church, opened a few weeks ago in the presence of his royal brother the Prince of Wales. It is not unlikely that the Queen's present visit to Cannes may have been prompted by a desire to see for herself this permanent memorial of a sad event in which the affectionate feelings of a mother must always be deeply concerned.—*Illustrated London News.*



THE QUEEN OF ENGLAND'S COTTAGE AT CANNES.

Making Roads.

Few people know how easily a good and properly macadamized road can be made, or understand how excellent and enduring such a road is. A man who thoroughly understands the system, and sees it carried out properly, will make a better road with a few inches of broken stones than others will make with three times the quantity of material, not to mention useless labor. Macadam cared very little what sort of a bottom he had to deal with, if it were not an absolute morass, and he was not often deterred by that. "For a road," he says, "it is not necessary to lay a foundation of large stones, pavement, etc., as it is a matter of indifference whether the substratum be hard or soft, and if any preference is due, it is to the latter." These statements look like heresy compared with much that we have read on road and walk making, but the great road maker was right, nevertheless. First of all, whatever the bottom was like, he took care to see that the ground had evenly settled before the stones were spread upon it, that there might be no subsidence in any part afterward to cause inequalities, a matter which is often overlooked. When the roadway had to be cut and leveled, large stones dug out of the ground, or any inequalities to be made up, the ground was afterward left to settle before proceeding further with the work. In putting on the stones, quite as much care was exercised.

The hardest stone in the district was procured—granite, flint, or whinstone; next, it was broken to the regulation size—in pieces about an inch in diameter, though a rougher size will do; and, lastly, the stones were not laid on the road, but spread shovelful after shovelful to the depth of from 6 inches to 10 inches, which was considered sufficient for general highway traffic. The road was made slightly higher in the center than at the sides, to throw off the water, as the object was to form an impermeable crust that would keep the water from percolating to the bottom, thereby rendering it soft and causing it to work up, the necessary drainage being, of course, secured in the usual way. This is macadamizing in the proper sense of the term, a system which has nearly superseded every other, but it is the attention to trifles in carrying it out that makes perfect work. For example, many people would attach little importance to the stones being broken or angular, and be quite as indifferent about the mode of spreading them on the road; yet these are two of the most important points. The use of water-worn stones of the same size will not make a solid crust, because they yield to pressure, their round surfaces offering little or no resistance; but it is different with broken stones, which when of uniform size, and clean, and properly spread on the ground, set fast on the same principle as that of an arch. I have seen roads made on an extensive scale on this system, and had to make such myself, and I have never seen anything to equal them.

Walks, which are often cut out deep and filled in the bottom with large stones, may be made on Macadam's principle with far less trouble and with much better results. Broken stones, to the depth of 2 inches or 3 inches, will be quite sufficient, and they should, after being spread on, be beaten even on the surface with broad wooden rammers. This sets the crust effectually at the beginning. Afterward a thin coating of clean gravel should be spread upon the surface to hide the stones, but no more. Such a walk is smooth and firm, and comfortable to the feet in all weathers; rain only washes it clean, and frost has not the least effect upon it if the bottom be drained. The material holds no moisture to freeze; it is the accumulation of soft gravel on the surface of walks that freezes and renders them so muddy and uncomfortable afterward. With us the stones are broken by a machine to any size we want them.—*J. S., the Garden.*

A COAT of boiled linseed oil rubbed over the iron scale beams used in damp cellars in which large quantities of salt are used in curing hides, and allowed to dry, is a good preservative. As the oil gets rubbed off, rub the parts again with the oil upon a cloth.

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NEW YORK, MAY, 1887.

THE

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ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

This is a Special Trade Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book pages, forming, practically, a large and splendid **Magazine of Architecture**, richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction.

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In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

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USEFUL HINTS RELATING TO HOUSE BUILDING.

We continue our remarks from February number. A good size for the lot for a house to cost about $5,000 is 60 × 150 ft.

If a stable in the rear is needed, the lot should be not less than 175 feet deep. This point, and those mentioned in the February article, are the most important to be considered concerning the *lot*.

The next subject to be settled upon is the plan and specifications for such a house as your limit of cost will cover. This is a most difficult undertaking, and often ends in disappointment, usually because *too much is expected for a given sum of money*.

If style of interior and exterior is required, the *size* must be curtailed. If the rooms must be spacious and numerous, then the style and finish must be plain and unpretentious, both within and without.

Of one thing be assured—everything cannot be obtained for $5,000 at the present cost of labor and materials.

This point fully understood, the writer has found that the quickest and best way to get the plan desired is to *look at houses already built* in the immediate neighborhood or adjacent towns, which approximate to the cost named. Among the many which are now to be seen in all our suburban towns, there will be no difficulty in finding a house which will entirely satisfy the requirements. No mistake can then be made in the *cost*, for the builder himself is near at hand to duplicate for you, for a definite sum, the house you may select.

Disappointment in architectural effect will not happen—because you can see beforehand what an appearance the *finished* house will present.

It is far better to go to an architect with *ideas well defined* of what is wanted, and to ask of him to add to these his own taste and skill, than to go (as many do) with nothing settled in the mind but the *cost*, and to require of him to produce something entirely original in design and finish. His effort to fill such an order is generally a failure, not from any want of skill on his part, but rather because of his inability to grasp the intangible and indefinite ideas which may be in the mind of another. He must have some standard to work up to besides simply the *cost*.

If the architect succeeds in his effort as to the plan, you may consider that you have made a fortunate beginning.

The specifications come next. As for these, let them be most carefully drawn, leaving nothing open, indefinite or obscurely stated, and to this end you could not do better than to read over the several specifications published by this paper, selecting therefrom the best points in each. Above all, have them so drawn that they cover everything you want. Otherwise you will have extras, which are always very costly.

It is a remarkable fact that anything *taken from* the specifications, after the contract has been signed, you can get no allowance for; but anything added to them greatly increases the cost. Why this should be so, only the contractor can tell you, and he generally *will not*. You may imagine, however, that the reason is, because, when the contract is once signed, he (the contractor) *don't want* to make any allowances, and *does* want to make all he can out of extras. Hence you must plan beforehand so as to avoid them. Or, in the pithy words of the late Rev. Henry Ward Beecher, "First think out your work, and then work out your thoughts." This applies pre-eminently to building operations.

COLD ROOM FOR EGGS, ETC.

To make a cold room or ice house that is dry or as free as possible from sweating, for preserving eggs, fruit, etc., make the room itself in any manner most convenient, but thoroughly insulated in regard to keeping the walls impervious to circulating air currents or crevices for interchange of cold and warm air, except under control, for the necessities of ventilation, which should be small.

A frame lined upon the inside with heavy paper and varnished with shellac, then ceiled and floored with matched pine, ⅝ or ¾ thick. Varnish the entire inner surface. Before putting down the paper lining and floor, fill in between the framing dry sawdust and pulverized charcoal mixed. Board up the outside with tightly matched boards, filling in as you board up with the saw dust and charcoal, as well as every part of the top, with the exception of the door for putting in the ice, as described further on.

The door for entrance to the room must be made to shut against broad jambs and angular closures like an iron safe, so that it cannot stick by swelling. It should be made by framing and packing with sawdust and charcoal, in the same manner as the room.

In the ceiling of the cold room frame an opening large enough to let in a galvanized sheet iron box of sufficient size to hold as much ice as you may wish to store, or about one-tenth of the capacity of the whole room. The ice chamber should be fitted into the opening tight, with a flange all around the top. It may be made of No. 18 or 20 galvanized sheet iron. To the bottom attach a coil of galvanized iron or lead pipe, running two or three times around the room, hanging on hooks or brackets, just below the level of the ice box. Pass the end of the coil through to the outside of the room and terminate in an inverted siphon, so as to retain the water within the coil up to a level just below the bottom of the ice box. This is for the purpose of economizing the cold from the waste water by circulating it around the room. From the cross beams of the ceiling, as bearing for the weight of the ice, place two or three straps of square iron of a size sufficient for carrying the weight of the ice you intend to put in. Let them hang upon the inside of the galvanized iron box to within an inch of the bottom. Upon these traps lay a hardwood grating. Make a galvanized iron cover to fit tightly upon the ice chamber, and a wooden one to close over the iron one.

To prevent the water that may be condensed upon the outside of the ice chamber from dripping down upon the goods, make the bottom of the ice chamber bulge a little downward, so that the condensed drops will run to the center, or one side, where a small pan may be hung, with a small pipe leading to the outside of the cold room, and a siphon attached to prevent ingress of air. The ice chamber may now be charged to its full capacity with ice, and if a very cold room is required, sprinkle a layer of salt between each layer of ice. Salt is seldom used for such rooms.

The principle upon which this cold room is constructed is that there shall be no communication between the ice with its moist vapor and the air of the cold room. Any moisture made by the cooling of the air, and which is precipitated upon the iron surface of the ice chamber, is at once conveyed out of the room by the drip pan and its pipe. Hence there is no need of any special ventilation, more than what will naturally occur by the use of the door and the small leakage through its closing crevasses.

The ice chamber requires no ventilation, hence economizing the ice to the best advantage, while the water from the melting ice is turned to the best account by circulating round the room in the waste pipe.

The best temperature for eggs and fruit is about 34°, or any temperature below 40° and above freezing, where this kind of stock is often changing by sale. If stock is to lie for a considerable time, 34° should be obtained if possible.

NEW WAY OF BUILDING CEMENT WALLS UNDER WATER.

Concrete made with hydraulic cement will set or harden under water in the most perfect manner, at almost any depth, but a difficulty has heretofore been experienced in depositing the concrete at the spot required without exposing the concrete to injury by washing when passing down through the water. This difficulty has been overcome in a very simple and effective manner by Mr. John C. Goodridge, Jr., C.E., of this city. He incloses the concrete in paper bags, and by means of a wooden chute or slide sends the concrete down by gravity to the spot required. The bags break open on reaching the bottom, and the concrete thus reaches its destination without injury from the water. This method was recently employed by Mr. Goodridge in repairing the great dam at Holyoke. About sixty thousand cubic feet of concrete wall were in this way built under water. The concrete was composed of Portland cement 1 part, sand 4 to 5 parts.

THE NEW LAW COURTS, BIRMINGHAM.

Her Majesty the Queen, on March 23 last, laid the foundation stone of the new Law Courts at Birmingham, of which we give an engraving from the *Illustrated London News*. Its principal front, in Corporation Street, will be executed in terra cotta, which is considered to be a material likely to resist, better than stone, the damaging effects of a smoky atmosphere. The architects are Mr. Aston Webb, of 19 Queen Anne's Gate, Westminster, and Mr. Ingress Bell. The style is Tudor Gothic, enriched with many ornamental details in harmony with the general composition, and the central main entrance, with its circular doorway surmounted by a pediment containing sculpture, the balustrade rising to an angle beneath a projecting turret, flanked by two lower turrets with cupolas, will have a good effect. The central part of the facade, with its grand windows, the dominant oriel in the roof, also the towers, and the gables of the wing buildings, equally well bear out the character of this architectural design. The interior will contain a fine hall, 80 ft. long and 40 ft. wide, the large windows of which are to be filled with stained glass, a Queen's jubilee memorial, representing some events of her Majesty's reign, two large assize courts, with rooms for the judges and the juries, and a bar library, three borough courts, and a coroner's court, with offices and waiting rooms. Above these will be grand jury rooms, and other apartments. In the basement will be a police station, with cells for prisoners. The whole building, which will cost £78,000 ($390,000), is to be constructed at the expense of the Birmingham corporation.

A RESIDENCE AT ORANGE, N. J.

The colored plate and supplementary detail sheet of this issue illustrate a house recently built at the corner of Tremont Avenue and Center Street, Orange, N. J., for Mrs. E. C. Raphel, from designs by Joseph A. Stark, Esq., the distinguished architect, of 12 Chambers Street, New York City.

The house forms a very commodious and complete family residence. It shows many original features of design, and its plan is remarkable for convenience. The house is very substantially built. The internal trim is plain, in oil finished white pine, but there are window backs throughout the first and second floors, and plaster cornices in all rooms except on third floor. The stairs are in hard ash, also the inside shutters and the front entrance door. The plastering is three coat work, with very best hard finish in all stories.

The cost of the house, complete, including all work enumerated below, and also including mantels, tiles, and fittings of three fireplaces of first floor, and mantels and tiles of two bedroom chimney breasts, also hot air heating, electrical service, and stained glass—in other words, the house ready for occupation—was $7,000.

The grading and laying out of the grounds, also bluestone flagging on streets, and fences and gates, are not included in these figures, neither is the architect's commission.

This residence was planned with the view of having a maximum space on each side of the house, and it is, in consequence, somewhat narrow and deep. The three reception rooms follow one behind the other, but each has access to the principal hall. The smoking room and gentlemen's lavatory, on the north side, are a feature of this house, and stamp it as a first-class residence. An inspection of the plans will show many other points of merit, especially in the plumbing department. The large front room of the third floor, which is marked "billiard room," and which would also make a capital nursery, is a great point. It must not be forgotten that this floor is a full 9' story. It has hot air in every room, and in the rear there is a water closet and wash bowl. The house throughout, from cellar to top, is uncommonly light and cheerful, all stairs and hallways are wide, and the floors are high.

The exterior design shows a substantial structure, well proportioned, symmetrical in parts, and, withal, picturesque. There is much interesting detail at various points. The sides are clapboarded, and there is a belt of shingles. The main roofs are slated. The piazza and balcony roofs are shingled, for color effect. The external chimney stack of south elevation (see supplementary sheet) looks very fine. The piazza is wide and airy. The double Mansard roof adds breadth and importance to the house.

Following is an outline of the main items of the specifications:

The cellar walls are 18" quarry stone, laid up in cement mortar, and topped with an 8" brick wall, faced with Hackensack bricks. The cellar walls are cemented on the outside, and the floor is of concrete, with cement face. The plastering is three coat work, hard finished, and there are cornices and ceiling centers to all rooms of first and second floors. The floor timbers are shown on section. The frame is of usual studding, sheathed, papered, and clapboarded or shingled. The roofs are slated, underlaid with felt.

Trim throughout in white pine, stained and hard oil finished.

Floors all white pine, except hall, which is yellow pine.

Sliding doors are five panels, others four panels, 1½" pine doors, with brass bolt locks.

Front door is executed in ash to design.

Sashes all have double thick glass.

All windows have paneled backs.

Inside ash shutters are provided as indicated on plans.

Other windows have outside blinds.

All rooms have picture mouldings.

The closets are all fitted up, and the pantry has two glass cases.

The outside of house is painted two coats.

All windows and doors have ash mosquito screens.

The principal stairs, from first floor to top, are of handsome design ash posts, rail, and balusters.

The range is Boynton's No. 8 Prize range, 40 gallon galvanized iron boiler.

Cast iron kitchen sink and slop sink. Planished copper pantry sink, 16 oz.; 16 oz. 6' bath tub.

Two marble top wash bowls, two Triplex wash-out closets, one spring seat hopper closet, one enameled iron wash bowl, two wood laundry tubs, are among the items provided.

Pipe for hot and cold water, A A lead, with wiped joints, and all faucets, stop cocks, traps, and plumbers' and tinners' work generally of best quality.

Electrical service is provided to principal rooms.

"Economy" hot air furnace, with supply to all rooms; Tuttle & Bailey's registers.

The soil pipe has a disconnecting trap, with fresh air inlet pipe, and the cesspool has three overflow branches.

The materials and workmanship are of the best description, and the house is substantially and completely finished in all its minor details, and is giving great satisfaction to the occupiers, and is very generally admired.

The contractors were as follows:

Carpenters—P. B. Fairchild & Co.

Masons—P. Coyne & Co.

Plumbers—M. & T. Chalmers.

All of Orange, N. J.

A COTTAGE (SHOWN IN APRIL NUMBER) AFTER ENLARGEMENT.

In our last issue we gave drawings, etc., of a small cottage, specially designed by Mr. Christopher Myers for future enlargement. We now represent the house as it appears after the alterations and additions have been made.

By a careful examination of the plans and elevations given in the supplementary sheet, and a comparison with those given in our last number (April), it will be seen that the object of providing a house which could be afterward enlarged without waste of material has been very successfully attained. For the purpose of comparison, the ground plans of the house, both before and after enlargement, are printed side by side on the detail sheet of this issue.

It will be observed there is practically no waste of material. All that is done is slightly to alter one wall, remove certain windows and doors and place them in new positions. All the remainder of the work consists simply of the additions necessitated by the enlargement. The sheathing and all other material is utilized in the new building, so that it may be said that there is no waste whatever.

As altered and now represented, the house would form a very desirable and convenient residence, with well arranged rooms and a pleasing elevation. The design is one which is, at the same time thoroughly economical.

Below is the specification for the alterations and additions, as well as two separate bills of materials; one for the alteration, and the other for the complete erection of the house in its form as now represented. This and our last number taken collectively, therefore, provide for (1) the erection of the smaller house, (2) the alteration and enlargement of the same, and (3) the erection of the larger house. When it is desired to erect the larger house at once, the drawings and bill of quantities will be taken from this number, and the specification (which answers for both houses) from the last, excepting that the plumber's specification, printed below, must be added.

The design was specially drawn for the SCIENTIFIC AMERICAN, and we shall be glad to give our readers any further information they may desire in respect to either house.

SPECIFICATIONS FOR THE ALTERATION AND ENLARGEMENT OF COTTAGE SHOWN IN APRIL NUMBER.

MASON'S WORK.

Excavating.—Do all necessary excavating for the cellar, depth to be 3" lower than the present cement bottom. Excavate for all piazza piers, stoop stones, cesspool, etc., complete, and remove the earth where directed.

Stonework.—Build foundation walls as shown, with stone to match those of present foundation, laid up with good sharp sand and cement mortar, flush pointed inside and all that portion exposed to view on the outside to be pointed to match that of the other wall, the side of the old wall which will be exposed in the new part to be neatly pointed up and the wall made perfectly secure, the wall to have a footing course underneath, 4" deep, made of grouting.

Brickwork.—Do all the brickwork as shown on the plans, the outside piers to be started on a good, solid foundation and laid up true and plumb. Build the kitchen jambs and fireplace with pressed brick, this fireplace to have a trimmer arch, and the pressed brick laid in red mortar. Furnish and lay a rubbed bluestone hearth and rubbed bluestone shelf.

Plastering.—Plaster the entire first, second, and third stories of new part, three coat work, hard finished; the closets and attic may be laid, the mortar to lie at least one week before using.

Cementing.—Cement the entire cellar bottom with Rosendale cement, at least 3" thick, and to come even with that in the old part.

Doorway.—Cut a doorway from old to new part, smoothly done, and neatly pointed up.

Bluestone.—Put bluestone sills to all cellar windows, 3" thick, and as smooth as the market will afford. All this work is to correspond with the work it adjoins.

Cesspool.—Build a second cesspool, same size as present one, and in the same manner; connect together with a 4" cast iron pipe, with end turned down in existing one. This pipe is intended to carry off the liquid from first to second. These cesspools to be as close as practicable.

Cistern.—Build a second cistern, to correspond with the present one, and built in same manner. Connect these with drain tile 4" in diameter, at bottom of cisterns. These placed as close together as practicable.

CARPENTER'S WORK.

All the work to be done in a good, substantial, and workmanlike manner, to the true intent and meaning of the plans and these specifications.

Size of Timber, etc.—Sills 3" × 8", first and second tier of beams 2" × 10", third tier 2" × 9". All 16" on centers. Rafters 2" × 6" × 24" on centers. All studding 2" × 4" × 16" on centers.

Frame the building in the strongest manner, in accordance with the drawings. All the joints fitted together, and the frame tenoned and mortised. Extend the piazza as shown on the plans; columns, brackets, rails, etc., to match those in their immediate vicinity.

Sheathing.—Sheathe the entire building diagonally with rough hemlock boards, nailed in each and every nailing. On this sheathing lay heavy building paper, well lapped and worked under the door and window casings and corner boards.

Roofs.—Form the roofs as shown on the elevations to match with the present house. Cover the roof with slates of size and color to match those of present house, the end cornice to be taken off and used as far as it remains good.

Tinning and Flashing.—Do all necessary tinning and flashing whatsoever to gutters, valleys, piazza roofs, etc.

Shingling.—Do shingling as shown. The old shingles may be used as far as they remain sound and good, and to particularly match those on the present house.

Window Frames.—Make all necessary new window frames, corner boards, etc., the same as those in present house. Take out the old frames, and these to be used in places provided for same.

Floors.—Lay the floors of white pine, those of first and second stories to be 4½" wide, those of attic 9½" wide, all well driven together and blind nailed.

Doors, etc.—For number and size see plans. Those of rooms to be 1½" thick, and those of closets 1¼" thick. The old doors taken out and used in their respective places on new part, hung and locked complete. Hardware to correspond with that of present house. Put in sliding doors where indicated in the old wall of house, these to roll on 4" "Hatfield's" patent sheaves, and to have astragal face sliding door locks and flush handles, stop and brass track complete.

Architraves.—Trim all the doors and windows with trimmings, jambs, stop heads, bases, etc., to match those of present house.

Shelving.—Shelve all the closets as indicated on the various floor plans; the pantry to have five shelves 14" wide. Bed room closets to have two shelves each, and to have strips underneath; each strip to have proper quantity of wardrobe hooks screwed thereto. This shelving to be supported on rabbeted cleats.

Bath Room.—Fit up the bath room as indicated on the plans, with ash, the tub to have casing on top and ceiled on the faces; the water closet fitted up with seat and riser; seat to have hinged cover. This water closet to be put together with screws, so it can easily be taken apart by the plumber for repairs; wainscot bath room with 2½" ash beaded ceiling, 4' high all around, and finished on top with nosing and cove finish.

Patching.—Do all necessary patching of every description to make the job complete.

Painting.—Paint the whole of the new part with white lead and linseed oil paint. Shellac all knots. Sap before priming coat is applied. Putty up all nail holes and over nail heads, cracks, etc., of every description, after priming is done; the color to match that of the present house. The tin work and leaders to have two coats of "Prince's" metallic paint.

PLUMBER'S WORK.

Drain Pipe.—Furnish and put in where shown on the plans, a 4" cast iron drain pipe, to run from inside of building. The drain pipe to be trapped inside of the cellar wall, and to be supplied with fresh air from the outside of the building, with iron pipe run through the foundation, and to have a perforated cover as directed by the architect. In every case use Y branches for all iron pipe connections.

Soil.—Furnish and connect with the drain in cellar a 4" cast iron soil pipe, and run same size up and out of roof, at least 4', and cap the same with the Smith's patented ventilating cap. Use Y branches for all waste connections. Coat the iron pipe with asphaltum, and in the cellar insert a 4" cleaning cap.

Calking.—The joints of all iron pipes are to be thoroughly calked with oakum and molten lead, and fastened into position with iron hooks; all joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipe, and lead pipes soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on the plans a 35 gal. galvanized boiler and provide with draw cock for emptying the boiler, and shut off cocks for shutting the water off from second story, and provide for circulating pipe complete. Connect boiler draw cock with the sink waste. Put in a combined safe and vacuum valve on pipe at top of boiler. Boiler to have the Lockwood stand.

Exhaust.—Run from the highest point in hot water

pipe a ½" lead pipe to carry same one foot above tank top, and bend over.

Pump.—Furnish and set in kitchen where shown on plans a No. 2½ Douglass horizontal double acting suction and force pump. Fig. 23, *b*, brass lined and connected to a 1¼ B lead suction pipe. Insert an air cock to prevent pipe from freezing in cold weather.

Supply.—From the pump carry a 1" A lead pipe to enter bottom of tank, the same to act as a house supply. Place a 1" finished stop with waste on the pipe in bath room. Provide a check valve near pumps, so that cold water over sink must be drawn by pumping. Hot and cold supply all through the house to be ⅝ A lead pipe, and all pipes are to be graded so they will drain perfectly dry. Control each floor separately by ⅝ finished stop and waste.

Sink.—To be an 18" × 30" galvanized iron, with two front legs, trapped with 1½" trap and lead waste of 1½ C, connected with 2" iron soil under floor, also insert a cleaning cap at the point. Sink to be supplied with hot and cold water through ⅝ A lead pipe and through "Peck's" improved lever handle bibbs. Flash the woodwork back of sink with 3 lb. sheet lead 15" high.

Bath.—Furnish and put up where shown on plans or as directed a 16 oz. tinned and planished bath tub, 5½' long, supplied with hot and cold water through ⅝ A lead pipe, and to have a nickel plated combination compress iron bath cock, with rubber hose and sprinkler. Waste through a 1¼" trap and 1½" C lead pipe properly connected to main soil. Furnish the nickel chain and plug.

Bowl.—Furnish and set where shown on plans a 14" patented overflow wash basin, of best Italian marble, with countersunk marble slab 22" × 30", and back 10" high. Supplied with hot and cold water through ½" A lead pipe and Peck's improved nickel plated basin cocks; to have 1¼ D lead waste pipe, trapped with a 1¼ trap and properly connected to main soil. Furnish nickel chain, plug, and fancy chain stay.

Air Chamber.—Place no cocks on end of pipe, but extend pipe at least 6", so as to provide an air chamber.

Water Closet.—Furnish and set in bath room where shown on plans an "Inadora" all porcelain wash out closet with drip tray, also set up a painted iron cistern, with flush tank attached. Supply cistern through ⅝ A pipe from main tank. Cistern to supply closet through 1¼ D pipe. Ventilate the closet trap with a 3" lead pipe, calked into main soil. Insert the nickel cup and pull in the seat.

Safe Pans.—The bath tub bowl and water closet are to be provided with 3 lb. lead safes turned up 2" all around, and to have a ¾" D waste pipe running to cellar.

Wash Trays.—Supply the wash trays with hot and cold water through ⅝" A lead pipe, and brass tray bibbs with flange and thimble.

Provide a 1½" lead waste, connected to main soil, and to be properly trapped. Provide necessary chains and plugs of brass.

Every trap to be placed as near fixture as possible.

Every trap in the house to be separately ventilated the same size as trap, and to either connect with main soil above bath room fixtures or run independently to 4' above the roof line and there cap.

Range.—Furnish and put up a Newport No. 8 range and connect with boiler. The hot water pipe from range to boiler to be ¾ A.

Tank.—Line the tank as given on plans with 16 oz. tinned sheet copper, and leave complete, with overflow and inlets.

Gas Pipes.—Put up gas pipes with outlets where shown on plans, and according to the rules of the Gas Light Co. All outlets are to be capped, and all pipes tested. All side lights are to be not less than 5' 6" from floor. All drop lights are to be hung plumb. All the fittings for the bath room to be located as directed.

Bill of Quantities for Alteration of House.

MASON'S WORK.

		At	
70	yards excavating	$0 25	$17 50
17	perch stone work	45	76 50
	Cement bottom	..	15 00
2	piers in cellar	3 50	7 00
1	chimney breast	..	75 00
5	cellar window sills	80	4 00
375	yards plastering	40	150 00
	Additional cesspool and connection	..	25 00
	Extra drains	..	5 00
	Additional cistern, etc	..	50 00
	General patching	..	60 00
	Total		$485 00

CARPENTER'S WORK.

No. of Pieces.	Size.	Description.	
1	6" × 8" × 22'	=	88 feet.
2	3" × 8" × 13'	=	52 "
3	4" × 6" × 22'	=	132 "
6	4" × 4" × 16'	=	126 "
4	" × 13'	=	68 "
2	" × 18'	=	48 "
5	3" × 10" × 15'	=	125 "
52	2" × 10" × 13'	=	1,144 feet.
26	2" × 9" × 13'	=	507 "
14	2" × 6" × 21'	=	294 "
7	" × 16'	=	112 "
6	" × 24'	=	144 "
1	3" × 6" × 22'	=	33 "
1	" × 12'	=	18 "
1	" × 20'	=	30 " = 2,931 feet, per M	$28 00	$81 70
200	2" × 4" × 12'	=	1,600 feet, per M	24 00	38 41
550	ft. hemlock boards, put on, per M			20 00	11 00
550	" slate, per sq. ft			7	38 50
550	" hemlock sheathing, put on, per M			22 00	12 10
650	" siding, put on, per M			35 00	22 75
30	" main cornice, per ft			30	9 00
10	" band, per ft			20	2 00
30	" water table, per ft			10	3 00
50	" piazza cornice, gutter, plate, etc., per ft			30	15 00
4	columns front piazza, turned, each			2 25	10 00
35	ft. rail front piazza, per ft			30	10 50
8	brackets for front piazza, each			25	2 00
225	ft. piazza floor and ceiling, complete, per ft			25	56 25
1,000	" first and second story floors, per ft			5	50 00
500	" third story floor, complete, per ft			4	20 00
	Stoops and lattice			7 00	7 00
3	cellar windows, each			1 75	5 25
4	first story windows, complete, each			8 00	32 00
3	second story windows, complete, each			7 00	21 00
5	third story windows, complete, each			5 00	25 00
7	first story doors, complete, each			5 50	38 50
6	second story doors, complete, each			5 00	30 00
4	third story doors, complete, each			4 50	18 00
250	ft. surbase, per ft			4	10 00
5	closets, complete, each			3 00	15 00
1	pantry			12 00	12 00
	Jobbing for other trades, including tearing away old work			..	75 00
	Extra sheathing, siding paper, and sliding			..	86 80
	Incidentals			..	40 00
	Finishing square bay			..	75 00
	Total for carpenter's work				$872 85
	Painting all new work as specified				50 00
	Plumbing, without sink and extra cutting				325 00
	Range				25 00
	Furnace, complete				170 00
	Mason's work as above				485 00
	Total cost of alterations				$1,927 85

Bill of Materials for the House Complete, as Represented in the Present Issue.

CARPENTER'S WORK.

No. of Pieces.	Size.	Description.	
1	6" × 8" × 20'	trimmer, =	80 feet.
1	" × 22'	" =	88 "
3	3" × 8" × 12'	sills, =	72 "
2	" × 13'	" =	52 "
1	" × 16'	" =	32 "
1	" × 24'	" =	48 "
1	" × 14'	" =	28 "
1	" × 30'	" =	60 "
11	4" × 6" × 22'	post, =	484 "
2	" × 20'	" =	80 "
9	4" × 4" × 10'	plates and ties, =	192 "
3	" × 14'	" =	57 "
1	" × 24'	" =	32 "
6	" × 12'	" =	96 "
2	" × 19'	" =	50 "
4	" × 13'	" =	69 "
2	" × 18'	" =	48 "
20	2" × 10" × 16'	beams, =	540 "
36	" × 21'	" =	1,260 "
5	" × 15'	" =	125 "
52	" × 13'	" =	1,127 "
10	2" × 9" × 10'	" =	240 "
18	" × 21'	" =	507 "
26	" × 13'	" =	503 "
34	2" × 6" × 21'	rafters, =	714 "
26	" × 16'	" =	416 "
6	" × 18'	" =	108 "
6	" × 24'	" =	144 "
1	3" × 6" × 16'	" =	24 "
2	" × 22'	" =	66 "
1	" × 12'	" =	18 "
1	" × 20'	" =	30 "
	Equaling	7,450	At	
	feet spruce timber, per M		$28 00	$208 60
625	2" × 4" × 12' rafters = 5,000 ft. hemlock, put up, per M		24 00	120 00
1,350	ft. hemlock boards, for roof, put on, per M		$20 00	$27 00
1,350	" slate, put on, per ft		7	94 50
2,550	" sheathing and paper, put on, per M		22 00	56 00
2,150	" siding, put on, per M		35 00	75 25
600	" shingles on sides, put on, per ft		6	36 00
230	" cornice, per ft		30	69 00
110	" band, per ft		20	22 00
160	" water table, per ft		10	16 00
100	" piazza cornice, gutter and plate, per ft		30	30 00
2	back piazza columns		..	3 00
1	short column		..	2 00
10	ft. rail balusters, back piazza per ft.		20	2 00
13	" filling, back piazza, per ft		30	3 00
6	columns, front piazza, turned, each.		2 25	13 50
1	short column		..	2 00
48	ft. rail front piazza, per ft		30	14 40
14	brackets for same, each		25	3 50
325	ft. piazza, floor, ceiling, and tin roof, per ft		25	81 25
2,800	" first and second story floors, per ft		5	140 00
1,400	" attic floor, per ft		4	56 00
	Stoops, lattice, etc		..	25 00
10	cellar windows, complete		..	17 50
17	first story windows, complete		..	136 00
14	second story windows, complete		..	98 00
9	third story windows, complete		..	45 00
	Front door, complete		..	10 00
14	first story doors, complete		..	77 00
12	second story doors, complete		..	60 00
8	third story doors, complete		4 50	36 00
2	flights stairs		..	75 00
	Cellar stairs		..	4 00
550	ft. surbase, per ft		4	22 00
1	pantry, complete		..	12 00
11	closets, complete		3 00	33 00
	Jobbing, etc., for other trades and incidentals		..	120 00
	Finishing square bay		..	75 00
	Total			$1,921 40

MASON'S WORK.

		At	
162	yds. excavating, per yd	$0 25	$40 50
60	perches stone work, each	4 50	270 00
	Cement bottom in cellar	..	30 00
4	piers in cellar	..	14 00
7	outside piers	..	21 00
2	stoop stones	..	8 00
3	chimneys	..	150 00
10	cellar window sills	..	8 00
	cellar steps and coping	..	20 50
1,100	yds. plastering	..	440 40
	Cistern, complete	..	50 00
	Cesspool, complete	..	40 00
	Drains	..	25 00
	General patching, etc	..	60 00
	Total		$1,177 40

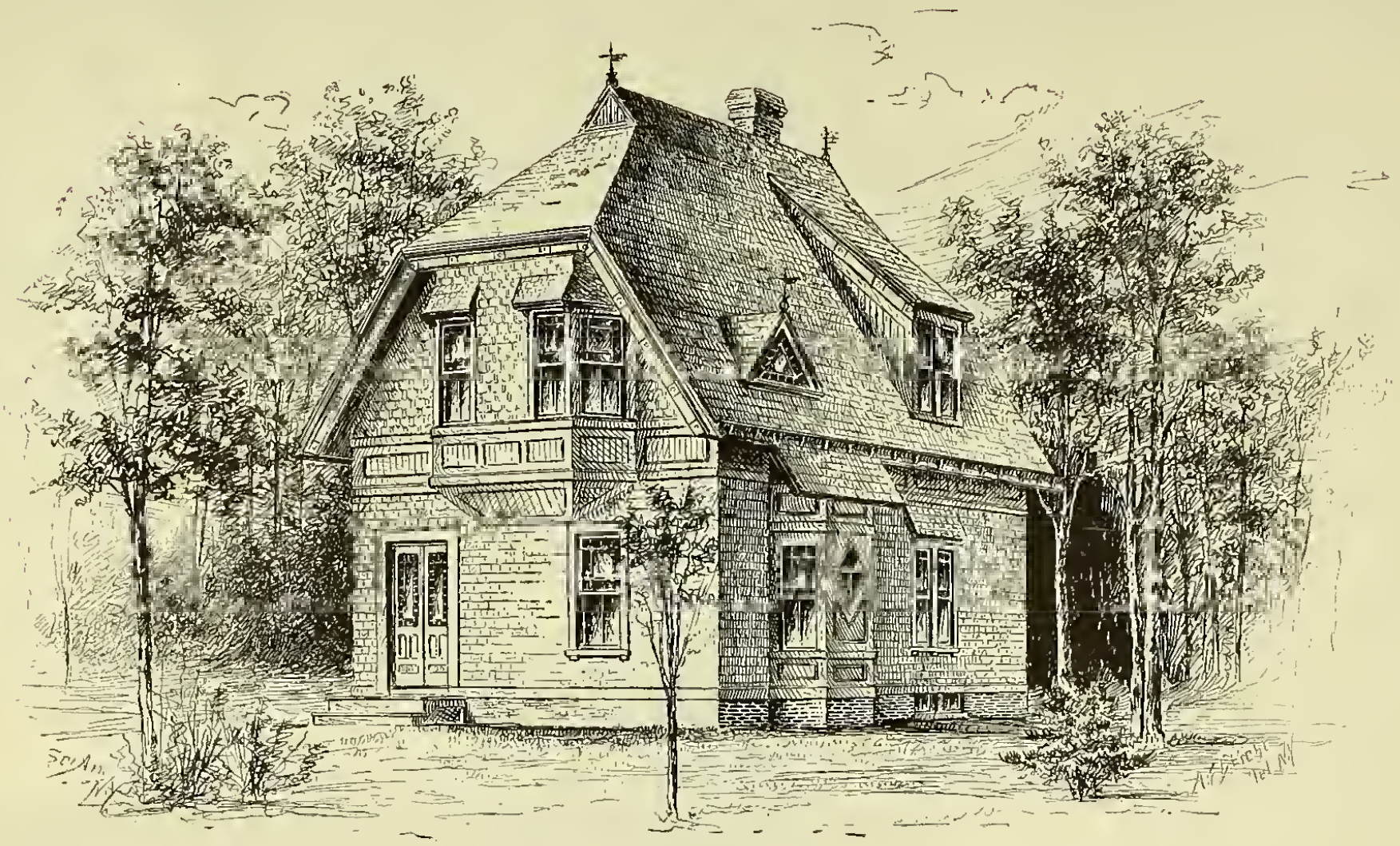
SUMMARY.

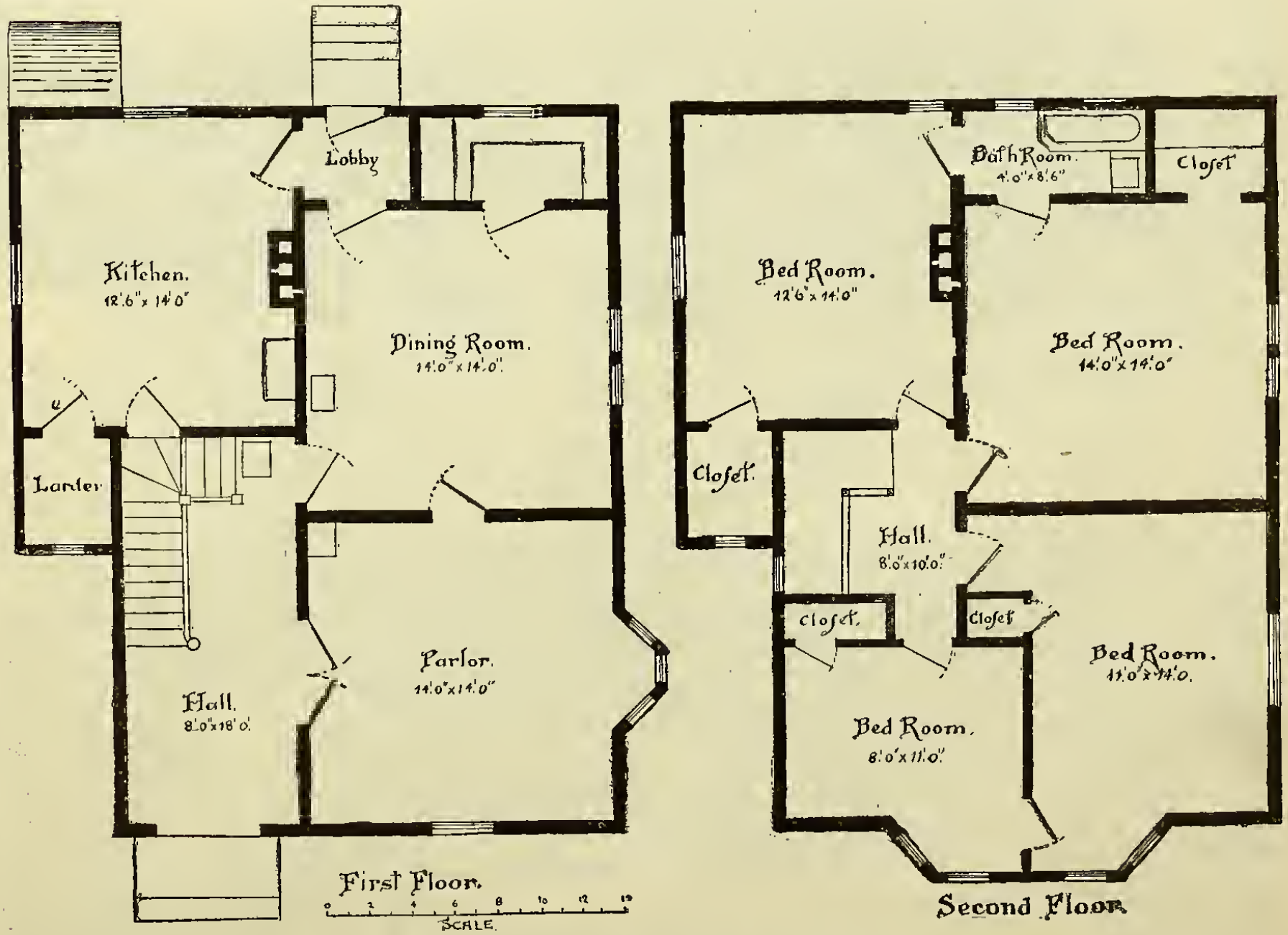
Painting	$200 00
Plumbing	320 00
Range	25 00
Furnace	170 00
Carpenter	1,921 40
Mason	1,177 40
Total cost of house	$3,813 80

Removing Paint.

When ordinary soda is exposed to the air, it has the property of absorbing, to a certain extent, the carbon anhydride from it, and especially is this so when the atmosphere is moist, the carbonic anhydride forming, with the moisture of the soda, carbonic acid. Soda being an alkaline substance, is, as we have already seen, the opposite to an acid, and when these two substances combine, a neutral salt is formed. Now, when soda is in combination with carbon, which we may often see by the whitish incrustation on its surface, or when it is in combination with any other substance, its facilities for entering into combination with a second substance are lessened to the extent of its combination with the first. This being so, we have to ask ourselves the question, How can we remove the carbon from the soda, so that it will enter more freely into combination with the oxidized oil of the paint?

Quicklime is a substance which has a greater affinity for carbon than soda. In slaking quicklime with soda, the lime enters into combination with the carbon of the soda, and by that means leaves the soda chemically uncombined with it, while it is chemically combined with the lime, forming carbonate of lime. The soda now forms a mechanical mixture with the carbonate of lime, and is ready to enter more freely into combination with the paint. The lime, or the carbonate of lime, has no action on the paint, any further than that the heat assists in driving apart more free y its molecules. The action of lime and soda on dry or wet paint is to form the whole into a soluble soap.





A TWENTY-FIVE HUNDRED DOLLAR COTTAGE.

[For description see page 100.]

A TWENTY-FIVE HUNDRED DOLLAR COTTAGE.

This convenient little dwelling was built for Mr. Amos C. Barstow, on a lot near Olney Street, Providence, R. I., under the superintendence of J. A. Bucklin, architect, of Providence. The cost, excluding a long fence, erected for the purpose of inclosing the lot, was $2,500.

SPECIFICATION AND CONTRACT.

Description.—The house is to be 23' 6" front, 33' 6" on side, with an addition 20' 6" × 4' 6" on the east side, making the rear of the house 23', with a bay window on each story, with all the pediments, dormers, and ornaments, as shown by the drawings. The height of the stories to be as follows: The basement to be 8' from top to top. The first story 10' 6" top to top. The attic story to finish 8' in the clear between the floor and plastering. The plates on the sides are to be 4' and on gable ends 2' 6" above the attic floor. Finials to be on peak and dormers.

Materials.—All the materials required to finish the contract are to be provided at the sole cost of the contractor, and to be of the kinds and qualities herein specified, but if not particularly enumerated, then they are to be of the first quality.

Works.—The contractors shall execute and perform, fully finish and complete, all the several works agreed upon as shown, indicated, or implied from designs and plans and working drawings made and to be made by James A. Bucklin, all to be done in the most workmanlike manner, under the direction and to the satisfaction of the said J. A. Bucklin as architect and superintendent of the said building.

Progress.—The building is to be immediately commenced and constantly prosecuted until completed, which shall be on or before the first day of July next ensuing.

Excavation.—The loam is to be taken off the lot the size of the house and embankments, and left in a heap where directed. The earth is to be excavated for the cellar and all foundations, drains, and cesspool, and left on the lot. All rubbish is to be carted away, and the premises left broom clean.

Cellar Walls and Foundations.—The outside cellar walls are to be built up the height to receive the brick underpinning, of good building stone, laid dry, the wall to be in no place less than 16" thick. The underpinning to be of first quality Croton, or equal thereto, brick, the walls 8" thick. The front and west side to be 7' high. The east side and rear 4' high. The cellar partition and chimney to be of first quality common brick. The top of the chimney, where seen, to be of the Croton brick, first quality. The partition walls to be 4" thick. The cellar partition at the stairway and water closet is to be of studs lathed and plastered both sides.

Drain and Cesspool.—A cesspool 5' diameter at the bottom and 8' deep, built 20' from the house, covered with a flat stone under ground, and to have 6" drains leading from the sink and water closet pipes.

Chimney.—The chimney is to have three flues, and in each room is to have 6" cast iron pipe collars built in. Two rooms are to have marble shelves, supported by iron brackets.

Plastering.—The whole interior of the first story and attic is to be lathed and plastered, and all overhead to be stuccoed. All sides to be skim coated suitable for paper. The laundry and cellar stairs and water closet in the cellar is to be lathed and plastered, the partitions on both sides. All the stone walls must be pointed, all the brick walls must have the joints struck smooth, and all the cellar sides and overhead must be whitewashed two coats.

Concrete.—The cellar floors are to be covered with concrete 3" thick, composed of one part cement, one part gravel, and two parts sand, and leveled off smooth.

Timber.—All the timber is to be of spruce, of the following dimensions: sills 6×6, floor joint 2×8, placed 16" from centers, studs 2×4, placed 16" from centers, partitions 2×3, placed 12" from centers, trimmers for chimneys and partitions to stand on, and stairs, 4×8, plates 6×6, girts 2×6, let into the studs, plates to partitions 4×6, rafters 3×7, placed 2' from centers, attic ceiling joist 2×8, spiked to each rafter. All to be framed in a proper manner and fitted to both.

Boarding.—The sides, roofs, and floors are to be boarded with sound, seasoned square edged hemlock boards, planed to a thickness, laid close and well nailed, and the sides and floors to be covered with felting paper, the joints to lap 2".

Shingles.—All the roofs and the sides of the attic story are to be shingled with first quality custom sawed cedar shingles. The pediments and sides of the addition and window caps are to be ornamental shingling, as shown by the drawings.

Tin Work.—The eaves gutters and valleys in the roofs of tin, and the four conductors, 3" in diameter, are to be of galvanized iron.

Clapboards.—The sides of the first story are to be covered with first quality sap clear white pine clapboards, nailed with fivepenny nails, driven not over 7" apart in each clapboard.

Dressings.—All cornices, window frames, fascias, corner and bottom boards, and other outside ornamental work are to be of sound, seasoned white pine lumber, clear of sap and large or loose knots.

Furring.—All overheads that are to be plastered are to be cross furred with 2"×1" furs, nailed to the joist 12" from centers.

Flooring.—The top floors of the kitchen and the kitchen and dining room closets, and the bath rooms, are to be of 3" wide Southern hard pine boards. All other floors to be of 4" wide spruce, all thoroughly seasoned and clear of loose or large knots, to be planed and jointed, laid in streaks, keyed up close, and well nailed and smoothed off with the smoothing plane. The outside steps and platforms are to be of seasoned 2" white pine, the platforms of 4" wide, tongued and grooved together. All to be clear of loose or large knots or sap. Lay single floor square edge in upper attic.

Windows.—The cellar window frames made of plank, with sash 1⅜" thick, hung with butts, and fastened both when shut or opened, and all to be cased as directed. All other windows are to have frames with parting slips and slip boards, the sash to be 1⅜ inches thick, and to have spring fastenings of the best quality to both upper and lower sashes. All to be glazed with second quality French glass. All to have outside blinds, properly hung and fastened. The top sash of all the windows are to be glazed with colored cathedral glass. See drawings, which will show the size of light. The scuttle is to be a heavy frame, with a plate of Hammond glass, 18"×18".

Doors.—The outside doors are to be 1¾" thick, built in form as shown by the drawings, with top lights and colored glass, hung with 4½" butts, and fastened with a Nashua front door mortise knob lock, with night keys and bronze knobs and escutcheons. All other doors to be 1⅜" thick, hung with 4" butts and fastened with a Nashua mortise knob lock.

The inside cellar doors may be good batten doors, properly hung and fastened. The trap door below the scuttle to be hung and to have weights attached. Size of trap door, 3 ft. × 4 ft. The folding doors in the front hall are to be glazed with enameled glass, and the doors in the upper and parlor halls are to be glazed with ground glass. The locks will be furnished by the owner and put on by the contractor.

Casings.—All the doors and windows are to be cased, as shown by the working drawings, with seasoned white pine, clean of large or loose knots or black sap. There is to be a roof scuttle, hung and fastened with a hook, and to have a step ladder leading to it.

Base Boards.—Base boards are to be put to all the rooms, stairs, entries, and closets. The kitchen to be ceiled up 3' high with tongue and grooved clear white pine 3" wide.

Stairs.—The front stairs are to be built of clear white pine lumber, as per drawings, with turned posts and balusters of ash. The cellar stairs are built under the front stairs, between plastered partitions. All turned work polished in lathe.

Closets.—The closets are to be fitted with shelves, cupboard drawers, and pins as desired, the drawers not to exceed ten in number. In the kitchen closet is to be a cupboard for a flour barrel, with a trap in the dresser. In the kitchen and laundry are to be iron sinks, with a closet under them. The bath rooms are to be finished in the usual manner, by easing the tubs and water closets, and ceiling the rooms 3' high. All to be done with ash.

Plumbing.—There is to be furnished, and set where shown on the drawings, two water closets, one iron one in the basement and one Bartholomew in the attic. One bath tub of iron in the attic. A close-head tinned copper boiler, to hold thirty gallons, placed at the range. In the laundry and in the kitchen are to be iron sinks, with all the necessary pipes for the supply of Pawtuxet water, and all waste pipes and soil pipes leading to the sewer, and from the sewer to the roof, for ventilation; and also pipes for hot water leading from the boiler at the range to the sinks in laundry and kitchen and bath tub, with all the necessary and desired faucets and traps and other fixtures to make a complete job. All supply pipes to be of sufficient strength to sustain the pressure of the Pawtuxet water. The water will be brought into the front of the house by the owner.

Gas Pipes.—Gas pipes are to be put into the house, to all the rooms, entries, closets, and laundry and furnace room, the outlets not to exceed sixteen in number. All the pipes to be according to the Providence Gas Co. standard.

Bells.—A bell is to be placed in the kitchen, with a bronze pull at the front door.

Painting.—All outside, except the main roof shingles, and all the inside woodwork, except floors, is to be painted two coats with white lead and linseed oil, of such colors as desired. This is to include all the ornamental shingling on the sides and pediment.

Sundries.—All cutting, casing, mending, and patching on account of plumbing, gas piping, registers, and furnace, must be done by the contractor.

Fences.—The lot is to be fenced with a board fence, planed and painted on both sides. The length to be 172', like the other cottage.

CONTRACT.

This agreement, made this.....day of..... by and between.....of the first part, and Amos C. Barstow, of the second part, both of Providence, R. I.,

Witnesseth:

The party of the first part, in consideration of the sum of two thousand five hundred dollars, to be paid ..... by the party of the second part, hereby agree to furnish the above specified materials and labor, and build and complete a dwelling house on a lot near Olney Street, in Providence. The whole of said work is to be performed and the materials furnished in conformity with the drawings and the above specifications, which are to be considered as forming part of this contract. The said party of the first part further agrees that the work aforesaid shall be immediately commenced, and constantly prosecuted until completed, which shall be on or before the first day of July next ensuing. The party of the second part, in consideration of the materials being furnished and the work performed as above required, hereby agrees to pay to the party of the first part the sum of $2,500, in payments to be made from time to time as the work progresses, upon a certificate from the superintending architect certifying that there is fifteen per cent more of the work done and materials furnished than the whole amount received and asked for, the last payment to be made in thirty days after the whole has been completed and accepted by the superintending architect.

Embossed Wood.

To produce upon wood at moderate cost the effect of carved work has been a difficult problem, says the *Furniture Trade Review*. There are many imitations of wood carving, but every one knows at a glance that they are imitations. The texture which is peculiar to all types of wood, and which in the fancy woods is so delicate and attractive, cannot be imitated. Hence, the ornaments in plaster, papier-mache, or some of the other plastic materials have fallen short of what was aimed at, because in effect they were lifeless and abortive.

Mr. C. W. Spurr long ago learned that wood was flexible, and when he saw what an important part embossed leather was assuming in decorative art, he determined that some such treatment should be applied to wood. It was said to be impossible, because the fiber of the wood, under the great pressure necessary to emboss it, would break. After seven years of experiment, however, the tentative efforts have resulted in the most perfect embossed wood examples, which are to all intents and purposes carved upon the surface of the wood. There is the fiber of the wood in a perfect condition, while upon the surface are designs of ornament in relief which only a carver can produce. How it is done would require a scientific article to describe, although a cursory glance at the process may not be without interest.

The process of Mr. C. W. Spurr, of this city, is as follows:

An engraver produces a design from which a mould is taken and an iron die cast. The layers of wood, with the grain so arranged that any defect is supplied by the under layer, are cemented together with a backing of canvas and placed under the die in a press which has the capacity of several tons. One would expect to see the life crushed out of the wood, but as it is flexible, and as its flexibility has been calculated upon, when the press is released a beautiful panel of embossed wood is found, which is as tough and flexible as the virgin wood. The ornament may be repeated to any extent, and it is in this reproduction that the value of the discovery consists.

By means of this process one may use wood hangings as an upholsterer would tapestries. He may begin at the front door, upon which he will hang the costliest woods, and thence go into the entrance hall, and so from one apartment to another, decorating them with the richest treasures of the forest, and in the most economical manner.

It is the costliness of carving which makes it so rare; but by this process, once the design is produced and the die made for it, there is merely the cost of labor and material.

The application of this invention is unlimited and the product is invaluable wherever decorative effect is sought. For panels of bedsteads, sideboards, chiffoniers, cabinets, pianos, organs, and a thousand and one articles where attractive effects are desired, embossed wood will be in great favor. It has been said that it bears the same relation to carving that lithography does to oil painting, but it seems to us that the comparison halts, as embossed wood and carving are identical, while lithography has a distinct surface from the artist's canvas.

MATTHIAS' DESIGN FOR THE GRANT MAUSOLEUM.

This design for a Grant mausoleum well deserving of public attention has been prepared by Mr. George Matthias, architect, of New York. Mr. Matthias has adopted for his design the Grecian form, which, for its simplicity and elegance, is unsurpassed by any other style of architecture. The total dimensions of the structure are 134 feet long, 120 feet wide, and 128 feet high. The material is intended to be granite. The main roof, as well as that of the porticoes, is also meant to be covered with granite tiles, while the statues are to be of bronze. There are four porticoes and steps leading up to them from three sides, while in the rear the steps are leading down to the vault underneath the rear end of the memorial hall.

This hall is entered through three richly paneled bronze doors, directly from the porticoes, which are connected by covered galleries. The walls and ceilings inside are to be finished in colored marble. Two sarcophagi of white marble, and a statue of the same material standing on a pedestal between them, are to be placed on a raised platform in the rear of the hall, inclosed by a railing. The figure between the sarcophagi to hold over each of them in outstretched hands a wreath of laurels. The ceiling of the hall to be laid out in richly ornamented panels. Six columns in the center of the hall carry the structure above, which is to let in the light through a stained glass skylight, worked into the marble panels of the ceiling. This latter structure supports also the pedestal, which is carried over the roof to receive a statue of General Grant. The statue is supposed to represent the great hero while making observations of the opposing army.

It seems to us that this part of the structure is excellently arranged. The statue is raised up sufficiently to be seen from the Hudson as well as from the surrounding country for many miles. The eagles at the foot of the pedestal, high up in the air, seem to be in their real element, and form an excellent feature of the design. So do the figures on the four corners of the main cornice. These statues represent the goddess of victory holding up in one hand the wreath of victory and in the other the palm of peace, thus well expressing to the popular mind what the valor of the great general accomplished for the nation. For he brought us peace and victory, the blessings which endeared him so much to the hearts of his countrymen. The figures on the porticoes represent the goddess of liberty, sword in hand, holding up the flag, while a goddess of war on each side stands ready to assist in upholding it.

Sleeping lions are placed at the four entrances, and remind the visitor, on entering the mausoleum, of the strength and courage of the great soldier who is supposed to rest beneath the walls of the edifice, intended to immortalize his deeds, which placed him foremost in the ranks of the greatest generals of all ages.

As a whole, Mr. Matthias' design compares well with others that have been brought to our notice so far, and we hope that its publication will contribute to revive the interest of the public for the contemplated monument to our dead hero.

DESIGN FOR A GRANT MAUSOLEUM RIVERSIDE PARK N.Y.

GEORGE MATTHIAS, ARCHITECT.

STEWART BUILDING NEW YORK.

Knotting and Its Uses.

Knotting, as its name implies, is a thin varnish used for coating over knots in wood preparatory to painting. No doubt every one in the painting trade is familiar with the brown stains which knots produce on paint when they have not been specially prepared. Before patent knotting was known, knots were chiefly treated with red lead, mixed with a little weak size as a binding agency, or gilded with gold leaf, this latter acting as an effectual stop to the resin of the knots. Now, red lead contains a good percentage of oxygen, which is ready to enter into combination with any other oxidizable substance, It has also the property of separating from drying oils the mucilage which prevents them from entering into combination with oxygen, when applied in the form of paint. We may suppose, from the action of the resinous or oily substance which exudes from the knots of wood, that it is composed also of mucilage, which is largely present in, perhaps, nearly all vegetable substances. Such is the fact with raw linseed oil, which is boiled with red lead, litharge, manganese, etc. These have the property of separating the mucilage from the oil, which otherwise would prevent its oxidization, or drying. In this way we often find that the paint on the knots of woodwork which has been newly primed is very often wet when the other parts, that are free from the resinous substances, are quite dry.

Patent knotting is a varnish which dries by the spirit volatilizing, and leaving the shellac in a solid form on whatever substance may be coated with it. The substances the shellac is dissolved in for making patent knotting evaporate very quickly, being in fact methylated spirits of wine, or naphtha. On account of the time which it takes for the spirit to evaporate, the resin has not time to enter into solution with the shellac, as it has in the case of paint. Again, the shellac presents an insoluble barrier to the oily substance which exudes from the knots. Paint, when once dry, also forms an insoluble compound, but in the case of paint put on unprepared knots, the resinous substance enters into solution *before* the paint has time to dry.

Strength of Paris Plaster.

The extraordinary forces of adherence, etc., of the Paris plaster enables the work on ceilings or partitions to be executed with far less expense of lathing than similar works executed with our lime and hair. Rondelet made experiments to ascertain the limits of these forces, and he obtained the following results. A parallelopipedon of plaster, with a base measuring one inch each way, supported a weight of 76 lb., acting so as to tear it asunder. This he called the force of adhesion. Similar figures resisted a crushing weight of 722 lb.; so that the ratio of the resistance of plaster to an effort of traction compared to one of extension is as 1 to 9½.

Rondelet found that there was a sensible difference in the manner in which plaster adhered to brick or stone, from the action of mortar under similar circumstances. For when cubes joined by the respective materials were subjected to forces tending to tear them asunder, the mortar broke through the center of the joint, leaving particles attached to the upper and under surfaces. Plaster, on the contrary, left the surfaces perfectly clean. In new works the plaster adheres to other materials with about half the force necessary to tear it asunder. Mortar, for several years at least, only attains one-third of the same force. This ratio does not continue, for after ten to twelve years the plaster loses its strength, while, at the same epoch, we find the adhesion of the mortar to other substances to be equal to the force of adhesion of the cubes themselves. The subsequent ratios are in inverse progression. Mortar always hardens by time; plaster loses strength. As these remarks only apply to its use as a mortar externally, it should never be employed permanently for such positions. Internally the loss of strength is not so rapid, for it depends upon the absorption of moisture from the atmosphere. For temporary works, for internal works, requiring great rapidity of execution, however, the use of Paris plaster is invaluable.—*G. R. Burnell.*

APARTMENT HOUSE, BROOKLYN, N. Y.

We present a second story plan and a perspective of an apartment house erected by Mrs. Mary Johnson in Quincy St. between Nostrand and Marcy Avenues, in the city of Brooklyn, at a cost of about $50,000, from plans by Amzi Hill, architect, 1161 Fulton Street, Brooklyn.

The building is 55 feet front and 95 feet deep, has a Trenton brick front with rubbed brownstone trimmings, the front of basement is of rock faced brownstone ashlar.

The balconies and cornices are of galvanized iron.

The building is heated with steam, by radiators placed in the several rooms.

The interior arrangement is probably the most perfect of any building of its size in the city.

Every room has at least one window communicating directly with the outside air and light, except the bath rooms, which are lighted and ventilated by a 5 × 8 feet brick walled light shaft.

Each bed room has a closet and one of Mott's folding wash basins.

The main hall is lighted by a galvanized iron skylight, 12 × 17 feet.

In the center of hall is a 5 × 7 feet hydraulic passenger elevator, with stairs around it.

A fireproof hall and stairs is placed at the rear of the building.

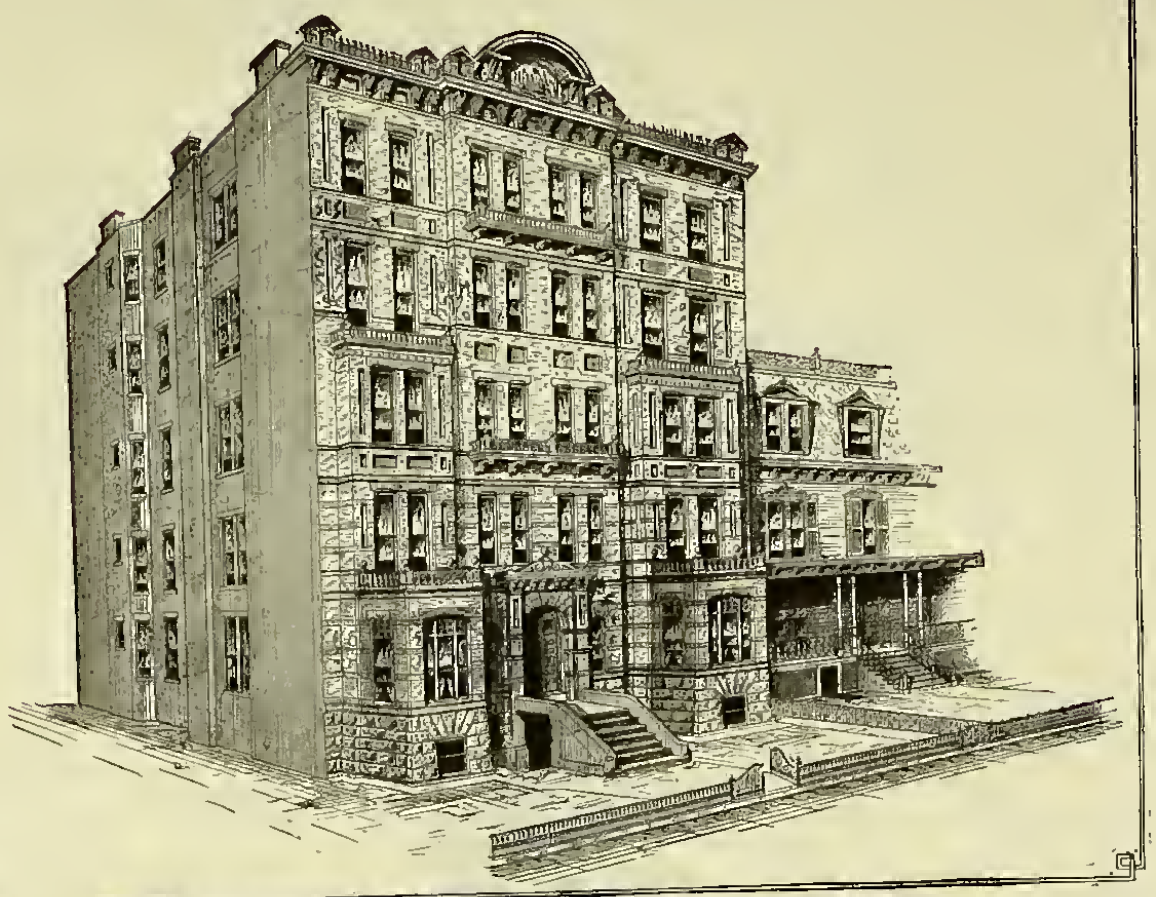
In this hall and near the kitchen doors are the dumbwaiter and ash shaft, all extending from the cellar to the roof.

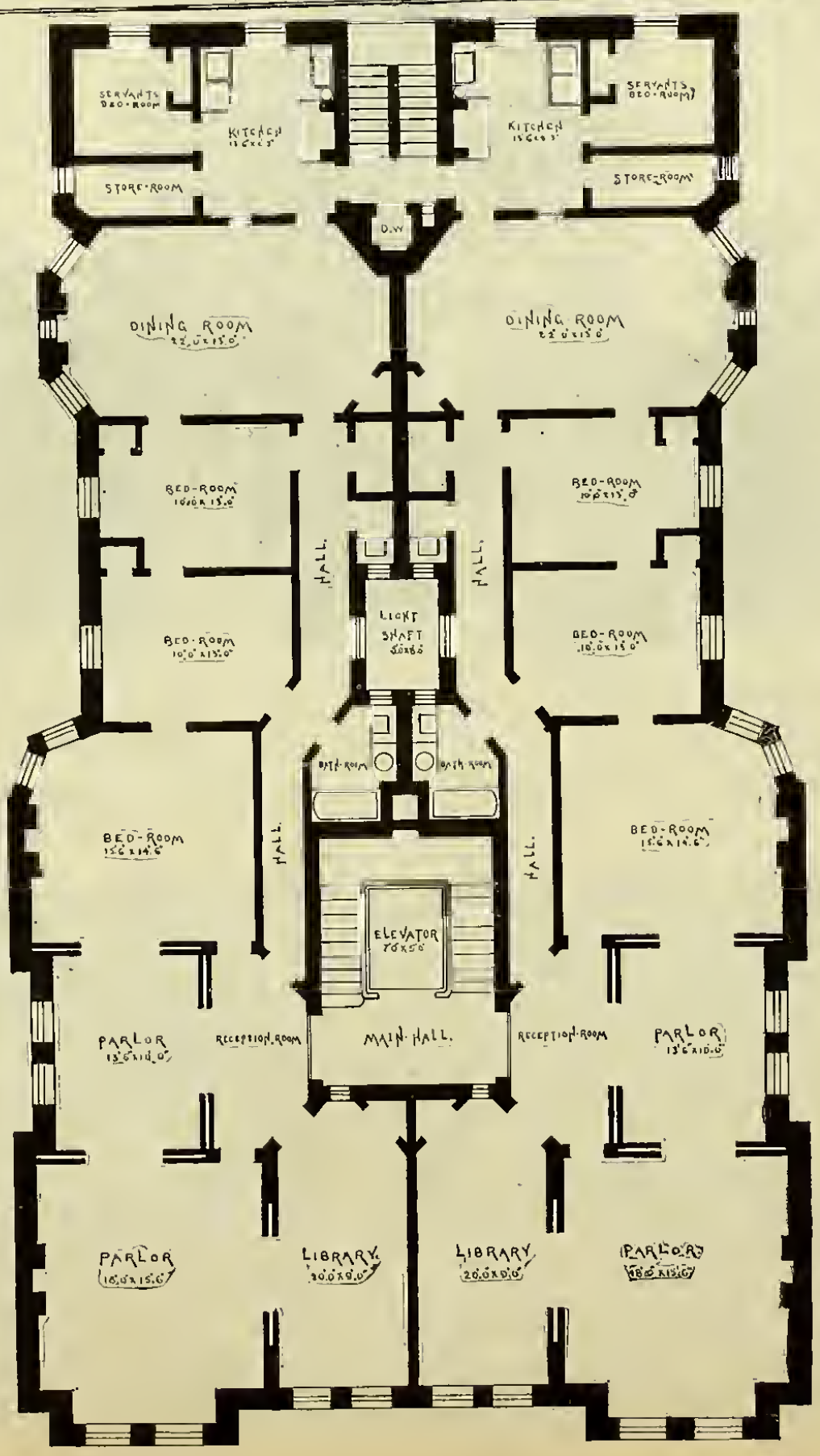
At the front of each apartment three or four large rooms connect with each other by sliding doors and arches, giving ample parlor room for those who require it, or some of them can be used as bed rooms by those who need more bed rooms.

Each of these rooms connects with a reception or ante room, which is lighted by stained glass doors, and from it a private passageway leads to the dining room, bed, bath rooms, etc.

The kitchen is placed at the rear, and communicates with the rear stairway, through which the servants can go down to the yard and to Lexington Avenue, by a rear alley way, through which all the coal and all groceries, etc., are brought into the building.

NEW APARTMENT HOUSE, BROOKLYN, N. Y.





Items Relating to Paints.

For rosewood a rather red ground is required. Use vermilion and chrome yellow. Graining color, Vandyke brown and ivory black. Lay this on freely, then wipe out with a sponge, using the blender to soften. A flogger may be used to advantage. Then overgrain with black, crossing the lines of the graining in curved lines.

Binding is an important feature in quick drying paints—dead colors—to insure adhesion to the work. If paint be mixed with turpentine alone, the latter will quickly evaporate and leave nothing but the dry pigments. Oil or varnish is added to bind the paint particles together. They, unlike turpentine, form a resinous coating by absorbing oxygen in drying.

Oil of turpentine may be deprived of its penetrating odor by rectifying it over five per cent. of its weight of unslaked lime added to it in the shape of milk of lime.

Ebony can be imitated on wood by first painting with one per cent solution of sulphate of copper. When perfectly dry, the wood is painted over with a liquid consisting of equal parts of aniline hydrochloride and spirits of wine. The blue vitriol acts on the aniline and forms nigrosine, a black which cannot be affected by acids or alkalies. A luster can be imparted by coating with copal varnish.

Ground for satinwood graining is similar to that for maple, a little more yellow being added. Raw sienna and umbers, or raw sienna and Vandyke brown make good graining colors. A sponge, a mottler, and a blender are the three tools principally needed. For overgraining, the same process may be followed as in maple; the grain, however, is generally stronger in satinwood than in the others, and not so curly. Study specimens of the real wood.

To make paint dry in half an hour, mix the colors in gold size and spirits of turpentine. Let each coat dry thoroughly before the next is applied. Varnish over, to give a gloss.

A wall exposed to cold and moisture may be coated with a compound of three-quarters of a pound of soap dissolved in ten pounds of boiling water, care being taken in applying it to avoid the formation of bubbles. A little alcohol assists in dissolving the froth, and causes the solution to penetrate deeper into wall. After twenty-four hours, a second coat, composed of a solution of sulphate alumina about half a pound in thirty pounds of water is added. We used Castile soap and common alum instead of alumina on a bad wall, and its action was perfectly satisfactory. (One pound of sulphate of alumina is equal to nearly two pounds of the alum of the drug store.)

A good drying black may be made with burnt lamp black mixed with cold boiled oil, turpentine and driers. A little blue improves it.—*House Painting.*

Water Back Explosions.

During the past winter quite a number of accidents have been reported from the bursting and explosion of the water backs to ranges. Among a number of remedies suggested for obviating such occurrences, the following, by a correspondent in the *American Architect*, possesses novelty, and may answer the purpose required of it.

The device consists of an air chamber made of corrugated sheet iron, placed inside of the water back; when the water freezes, it will expand 0·089 of its bulk; and as the compressibility of air exceeds this by far, an air chamber of, say, one by two inches, in an ordinary size water back, will accomplish the object, and danger of bursting or exploding is averted, either from the expansion of ice or pressure of steam; to make sure, I have added a device in the shape of a plug placed in the top of the water back, held in its place by a spring, which will allow the plug to rise up under a certain pressure of steam, thus acting as a safety valve; when, then, the connections between the water back and boiler are made with lead pipe, instead of iron pipe, the writer adds, all danger of bursting or exploding is averted.

A TWO THOUSAND DOLLAR HOUSE.

SPECIFICATION

For a two story and attic dwelling house, designed for Mr. H. G. Bell, Rutherford, N. J., by B. J. Schweitzer, architect, No. 84 West Broadway, New York.

EXCAVATION.

Cellar.—To be under the entire house, 3 feet 6 inches deep.

Cistern.—To be 8 feet in diameter and 10 feet deep.

Cesspool.—To be 7 feet in diameter and 8 feet deep.

Privy Vault.—To be 4 feet 6 inches by 4 feet 6 inches, and 4 feet deep.

Trenches for all pipes not less than 2 feet 6 inches deep.

Grading.—Clean up the lot and grade off as directed after all other mechanics.

MASON WORK.

Cellar.—Lay up the cellar wall 16 inches thick of good quarry stone in lime and cement mortar. Above the ground build an 8 inch hard brick wall in good lime and cement mortar, and point up complete inside and outside.

Chimneys.—Build the chimneys of good hard bricks, laid in good lime and cement mortar. Strike all the joints of the flues, and put in a stove pipe hole, with collar and thimble, in each room.

Piers.—Build all piers of good hard bricks, laid in good mortar, complete.

Cistern.—Build the cistern with brick wall and arch over. Cement the inside and warrant it water tight. Connect all pipes from leaders, and also overflow pit.

Privy Vault and *Cesspool* to be stoned up dry.

Bluestone.—Furnish bluestone caps for both chimneys, and bluestone copings and steps for the outside cellar entrance.

LATHING AND PLASTERING.

All walls and ceilings on first and second floors are to be lathed with best spruce lath, and all are to be plastered two good coats of tempered mortar, and then hard finished with good finishing lime and plaster Paris.

CARPENTER WORK.

Posts 4 x 6 in., sills 4 in. x 6 in., and interties 4 x 6, all framed together, all hemlock. Floor beams 2 x 9, placed 16 in. from centers; rafters 2 x 6 and 2 x 8 in., all hemlock. All studs, 3 in. x 4 in. at openings. Brace all angles with long braces and fill in the frame and partitions with 2 x 4 in. wall strips, placed 16 in. from centers.

Sheathing.—Cover the entire frame with hemlock boards, and put on good resin-sized sheathing paper.

Siding.—Cover the first story with No. 1 narrow lap siding.

Shingles.—Cover the second story and gables with 6 in. x 16 in. sawed shingles, laid 6 in. to the weather.

Cornices and Trim.—Build all cornices of best white pine, as per drawings. Furnish and put up crestings and finials all complete. Curve the roofs over the porch and front bay window, and build all drips watertight. Build porch steps and rails complete, of white pine.

Tin.—Flash all valleys and gutters, also all chimneys, drips, etc. Cover all flat roofs with good I. C. tin complete.

Slate.—Cover all the other roofs with best Bangor slate.

Piazza.—Floor to be covered with 1¼ in. white pine flooring, with white lead in the grooves. Rear stoop floor same as piazza floor.

Leaders.—Put up ample leaders to convey all water from all gutters to cistern.

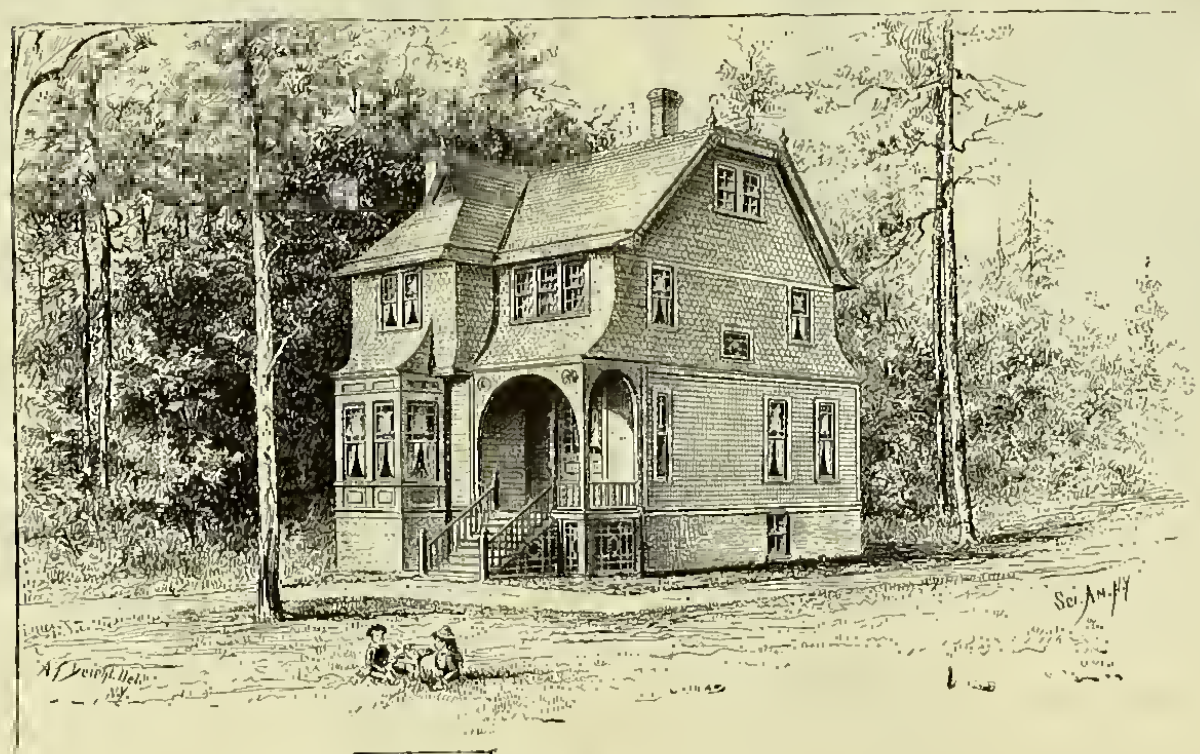
Windows.—All sashes 1½ in., glazed with French sheet glass double thick. The upper panels are to have marginal lights filled with cathedral lights. Hang all on pulleys, cords, and weights, and furnish with the "Ives" sash fastener.

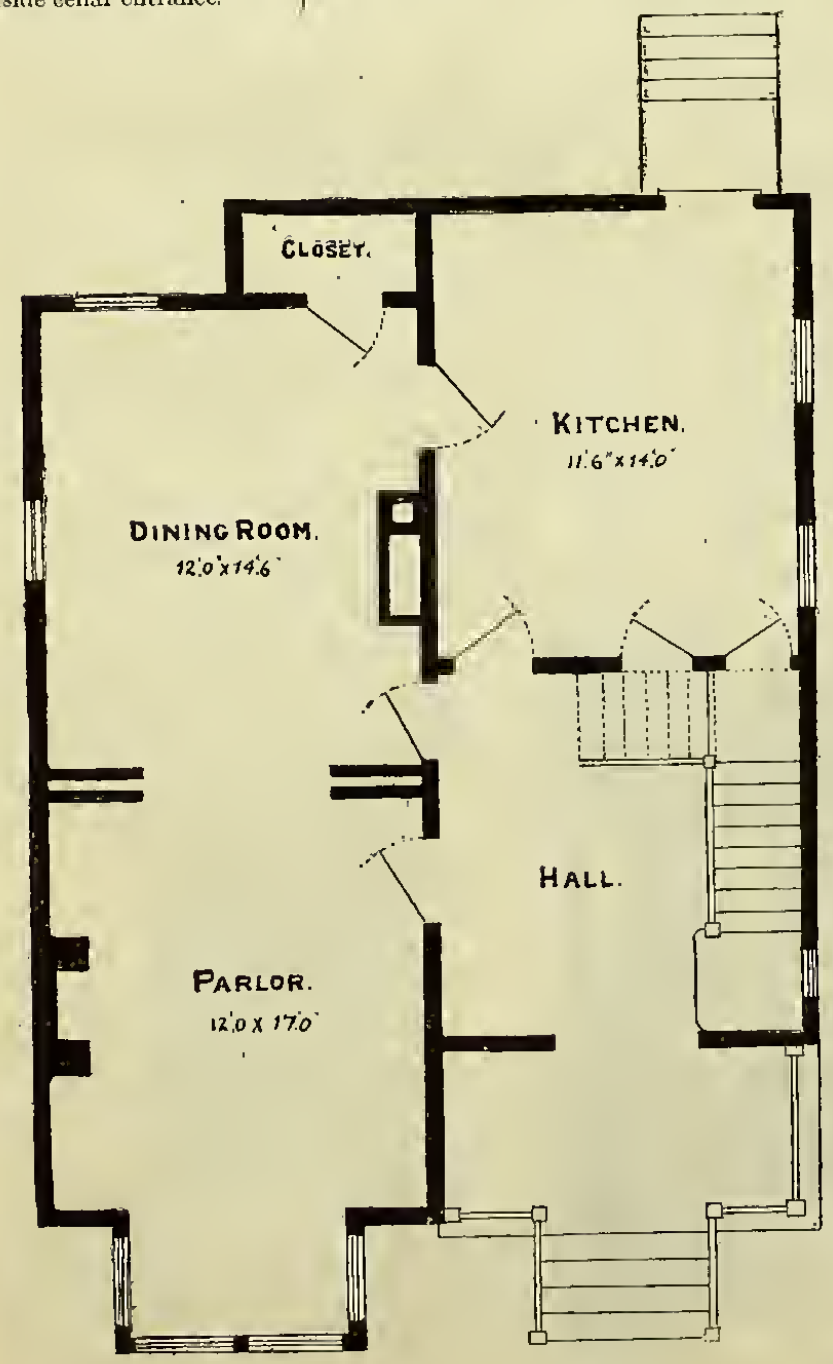
Blinds.—Furnish outside blinds for all windows 1¼ in. white pine, and hang them on good New York hinges. Also provide suitable fasteners.

Doors.—Outside doors 1¾ in. thick, paneled, as per elevations, and glazed in upper panels. Hung on good hinges, 4 x 4, and furnished with latch and lock complete, with bronze furniture. Also bolts, etc. Sliding doors furnished with Prescott's hangers and flush pulls. All other doors, except closet doors, 1⅜ in. thick, hung on good hinges, and furnished with mortise locks and jet knobs and furniture. All closet doors 1¼ in. thick, furnished with rim locks, all complete.

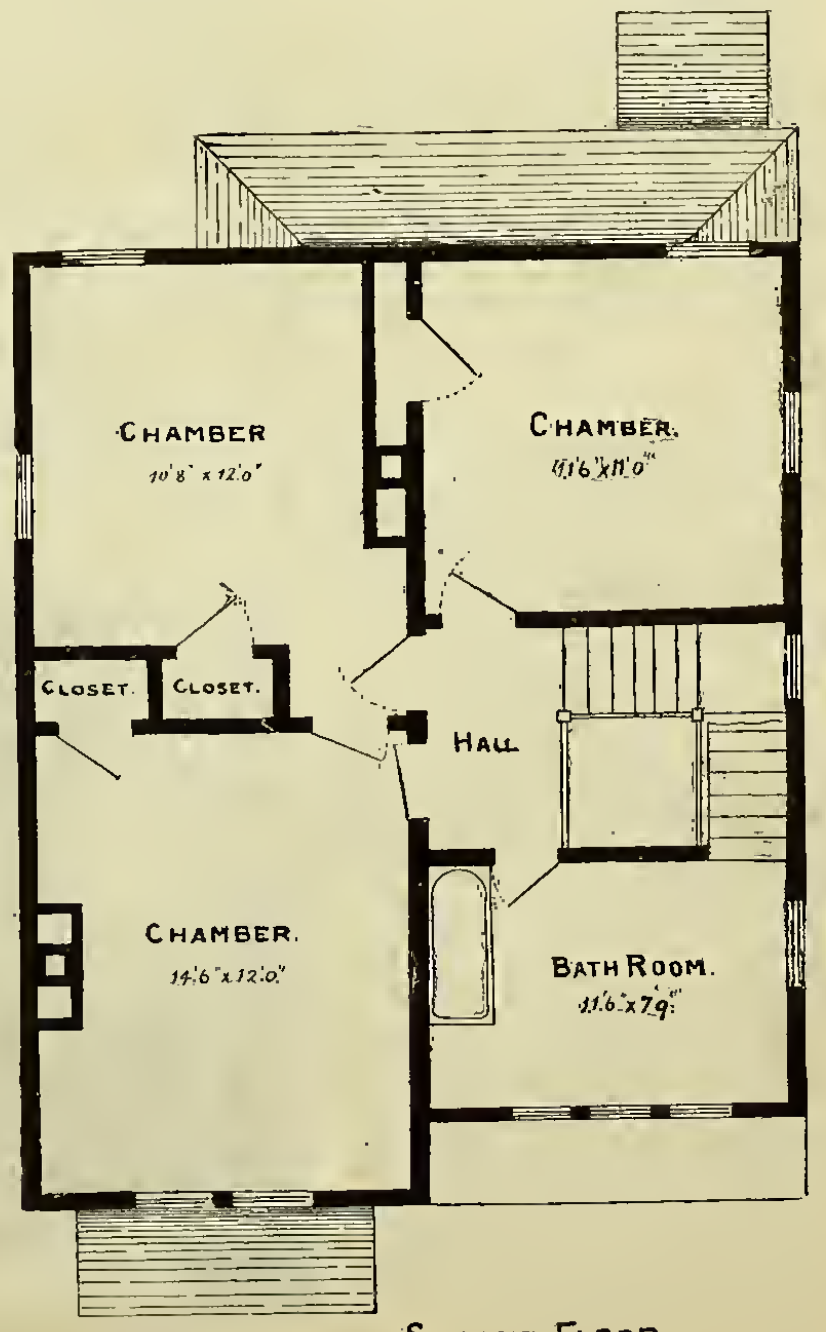
Floors.—All floors are to be covered with ⅞ in. x 4½ in. white pine flooring.

Inside Trim.—All casings are to be 5 in. Queen Anne, with turned corner block. All windows to have aprons and stools. Base on first and second floors 8 in. All closets are to be shelved, and wardrobe hooks are to be furnished on second floor.





FIRST FLOOR.



SECOND FLOOR.

A TWO THOUSAND DOLLAR HOUSE.

Stairs.—Build the risers of ⅞ in. white pine, treads 1¼ in. white pine, and strings 1¼ w. p. Wedge and glue together, and support the same in a proper manner. Balusters, 1¾ cherry. Newels, 7 in. on first floor and 5 in. at second and platforms. Rail, 3½ x 3½ in. Queen Anne. Attic stairs built in same manner, and inclosed.

Privy.—Build the privy over vault of ceiling boards, in usual manner, with seats, window, vent pipe, and door, all complete.

PAINTING.

Paint all metal work two good coats of Brandon metallic paint in linseed oil. Paint all shingles and other outside woodwork two best coats of white lead in linseed oil in tints to suit. Stain all inside woodwork, and varnish it two coats of No. 2 varnish, all complete and satisfactory.

FINALLY.

Do all that is necessary to finish the house in a faithful and workmanlike manner.

HEATING BY HOT WATER CIRCULATION.

It is not always easy to decide as to the proper method of warming dwellings. The best one can do is to choose that system which has the most advantages and the fewest defects. Latterly, heating by means of hot water has come into prominence, and justly so, as it presents advantages over both steam and furnace heat. In furnaces it appears almost impossible to avoid the dust that seems to be inseparable from registers, and with steam there is apt to be too much heat for mild weather.

In this connection we call attention to a new system of hot water heating, devised and patented by E. N. Gates, of Holyoke, Mass., which is simply constructed and easily managed.

In the engraving the separate boiler for each current of hot water is shown, and the direction the circulation takes, the fire under front end of boilers having given the benefit of its greatest heat to water just as it leaves the boilers, passes over bridge wall and, giving out remainder of heat to portions of boilers which are cooler, until it reaches the back end, where water enters, from return pipes, and having parted with all the heat possible, the coolest part of heated current is passed out at bottom through smoke pipe. Any number of boilers of different sizes can be arranged over the fire.

The following special advantages are claimed for this system:

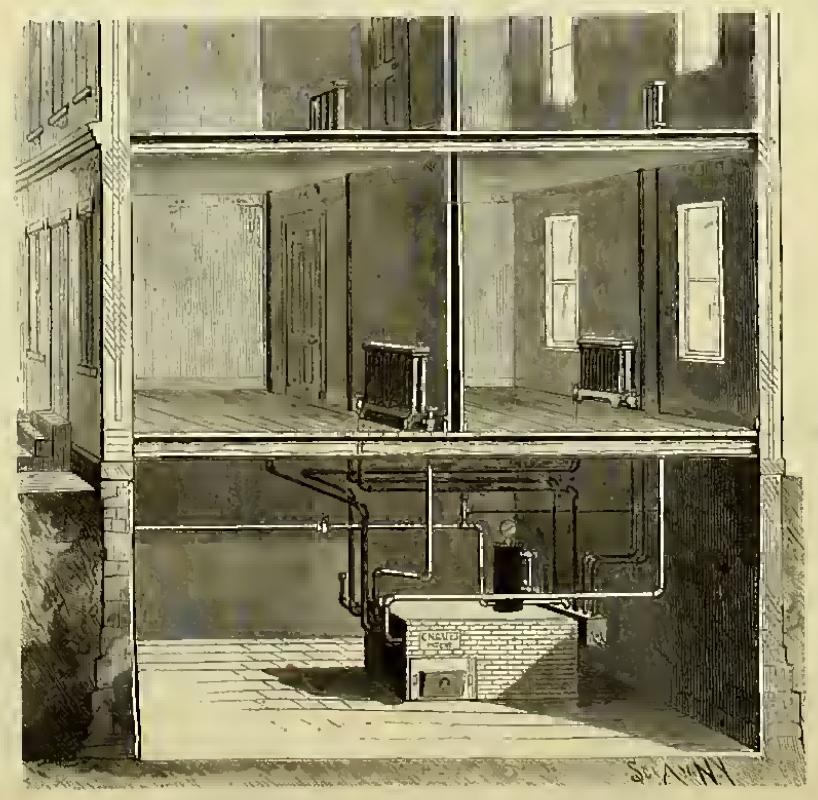
1st. Over hot air furnaces.—Ability to send the heat where it is wanted, without regard to direction of wind or height of cellar, and using less fuel for amount of space heated, and freedom from dust, burnt air, and gas.

2d. Over steam, high or low pressure.—From the fact that the temperature of water in radiators can be between 70° and 212° or higher, thus adapting it to all degrees of outside temperature, making a saving in fuel and insuring even heat.

3d. Over other hot water systems.—In others the water goes to radiators from one common reservoir. Therefore, it is almost impossible to have all rooms heated alike. With this system all rooms can be heated alike, when desired, from the fact that each current is provided with an independent boiler, and as the hot water must go where the pipe leads, you have perfect control over every room.

In this apparatus, the temperature of smoke leaving the apparatus is lower than return water from the rooms, showing that full benefit is derived from all the fuel used. The apparatus is so constructed as to be entirely free of any chance of freezing and bursting, as water can be removed if the house is closed in cold weather, and the fire allowed to go out for any length of time. These hot water radiators will heat with a low fire, and will give out heat not only as long as there is any fire under the boiler, but after the fire is completely out, and until the apparatus becomes of the same temperature as the atmosphere of the room, which requires several hours. The fire pot is lined with fire brick resting on grate frame, on which rests a patented rocking grate, operated by shaking bar outside of brickwork, grinding up all clinkers, which pass into a large ash pit.

A number of these heaters have been put in operation during the last year, and are giving perfect satisfaction. The extreme cold of the past winter has thoroughly tested all kinds of apparatus. We advise any of our readers who contemplate putting in new heating apparatus, or who are not satisfied with what they have, to correspond with E. N. Gates, Holyoke, Mass., who will be pleased to send them illustrated pamphlet, describing the system in detail, and give the opinion of those who have had the system in operation.

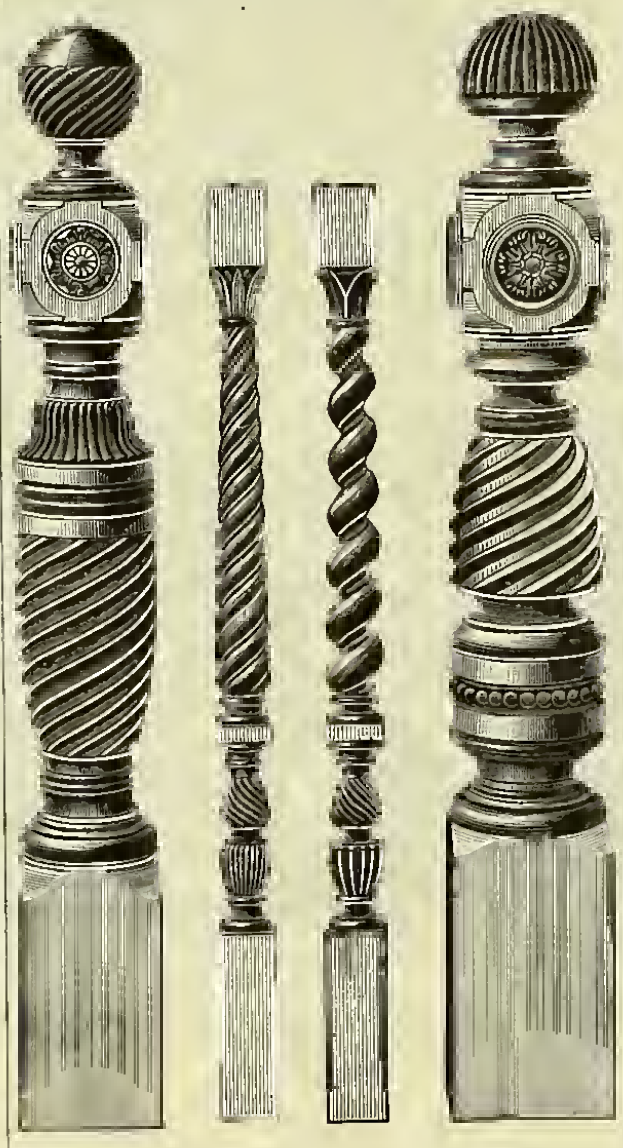


HEATING BY HOT WATER CIRCULATION.

THE Japanese and Chinese use a cement made of rice flour mixed with water.

ARCHITECTURAL WOOD TURNING.

In this connection we show some new designs recently executed by Messrs. Anderson & Dickey, 43 Bristol Street, Boston. This firm uses only the best machinery, and several of the special machines were designed by Mr. Anderson. One of these machines enables them to twist pieces in any curve or shape desired, in sizes from one-half to twelve inches in diameter. They will be pleased to send their illustrated catalogue, showing a large line of stair posts,



newels, etc., to any address upon application. They also make a specialty of work from architects' designs.

Ready Mixed Paints.

A superior paint may be defined as one that will permanently retain its original color, and that will, for an indefinite period, resist the destroying effects of the atmosphere. Upon the first depends the good appearance of the paint, even after having been exposed for a long time to all changes of the weather, and upon the second depend the preservative qualities of the paint. It is evident that the durability of a paint, considered merely as a coating or covering for wood or metal, and not as an artistic decoration, is controlled directly by the vehicle or liquid carrying the pigment. It follows as a natural sequence that we very seldom find a mixture of a durable vehicle with an inferior pigment, as the latter by losing its color in a short time would serve to condemn the paint; the same remark applies to the combination of a superior pigment with a poor vehicle. It may therefore be considered a safe and general rule to avoid those paints which may be said to "wash off," and also those which fade, as all of the ingredients in both cases are certainly inferior. The contrary to this is also true, and a paint that will either hold its color, or remain where placed for a long time, is composed of the best materials, as it would be an exceedingly foolish proceeding on the part of a manufacturer to give his paint one good characteristic and not the other, especially when both are absolutely necessary.

It is a simple matter for any one to satisfy himself in regard to these points. In almost any neighborhood, two houses may be selected which have been painted three or four years. One appears dingy and dirty, and it is impossible to tell what the original color was, while a closer examination shows that the paint has disappeared so thoroughly and effectually as almost to make the grain of the wood discernible. In this case both pigment and vehicle were poor. In the second house, the paint, wherever it has not been discolored by dust, retains its color perfectly, and a near inspection shows that but little has been worn off. Each ingredient in this instance was of the best quality.

It requires unusual skill and experience even for the manufacturer to tell by examination whether a given paint with which he is not familiar is first class in every respect, and ninety-nine out of every hundred consumers are compelled to rely solely upon the reputation and standing of the firms they buy from. There is no quick way of practically ascertaining the wearing qualities of a paint, they cannot subject a sample to an exposure to the weather for four or five years, and yet there is no simple or shorter method of finding what they want. A paint recommended because of only one excellent point should be viewed with suspicion—that is, a paint for which only a good body is claimed, or in which only the colors are warranted fast, should be avoided.

The present plan of marketing ready mixed paints is far more reliable in every way than the old method, since it leaves no operation to be performed by the unskilled consumer or local dealer. The paint as it now leaves the works is ready for immediate use, and it is natural to assume that it will prove to be better, as every step in its preparation has been benefited by the skill and long experience of the manufacturer; this also places the responsibility upon the producer. The painter or dealer now has nothing to do with the making of the article he uses or sells, the days of the "little mill" having passed away. One of the most important advantages resulting from this is the uniformity attained in the color and quality, and the ease with which colors may be exactly duplicated; another advantage is in the lessened cost to the consumer, as improved machinery takes the place of hand labor in the mixing.

One of the oldest paint manufacturers in this country is the firm of Chas. M. Childs & Co., of 225 Pearl Street, this city. This firm has been doing an extensive business for more than a third of a century, and during all that time there has been *no complaint touching the quality of these paints.* For the past fifteen years they have been engaged largely in the production of dry colors. This fact gives them a positive advantage, as it personally acquaints them with the peculiar features of every ingredient they use, and enables them to confidently place the standard of their products. At Tuxedo Park the colors from these works entered into all the paints used.

As a result of the immense increase in the consumption of ready mixed paints, they have turned their attention to that branch of the business, and have, consequently, procured the latest and most improved machinery. Their long experience and familiarity with all pigments enable them to turn out, as they claim, paints of superior quality, while the location of their works in South Brooklyn near the Atlantic Basin gives them all the advantages to be derived from cheap transportation of all raw materials and of the finished products.

This firm will, if they receive an idea of the colors wanted, furnish such shades as will be sure to be pleasing to the eye and will agree with the conceptions of the owners or builders. When necessary, they will endeavor to fill orders given descriptively of any colors desired, and will undertake to match precisely any sample that may be sent them. The specimen cards of colors they send upon application have been found by architects to be extremely useful, by giving them harmonious combinations, and thereby allowing them to present their ideas in a more complete and finished form to their clients. These paints have been used by and are strongly recommended by the celebrated architects Bruce Price and H. Edwards Ficken.

LAKE Tahoe is to be used to irrigate lands in Nevada.

A NEW RULER AND SECTION LINER.

In all descriptions of mechanical drawing, an instrument by which lines may be readily drawn at any desired distance apart is a very valuable adjunct. Various appliances for the purpose have been invented from time to time, few of which are as complete or serviceable as that lately brought out by Messrs. Frost & Adams, of No. 37 Cornhill, Boston, Mass., under the title of the "Universal Ruler and Section Liner." An idea of the general form of the instrument may be gained from our engraving in Fig. 1, while Fig. 2 will illustrate a few of the principal uses to which it may be applied, this cut having been drawn with the ruler.

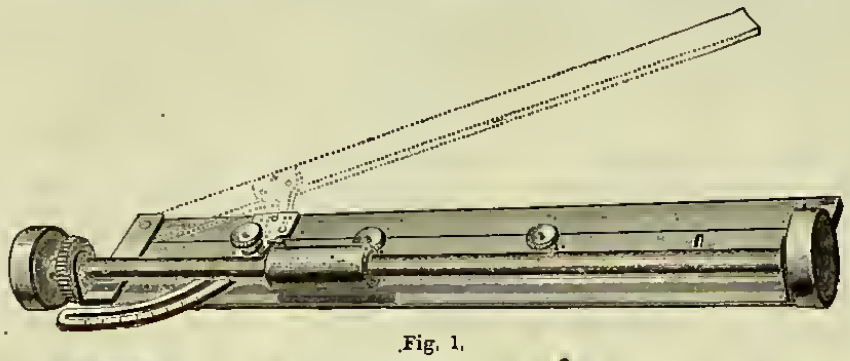


Fig. 1.

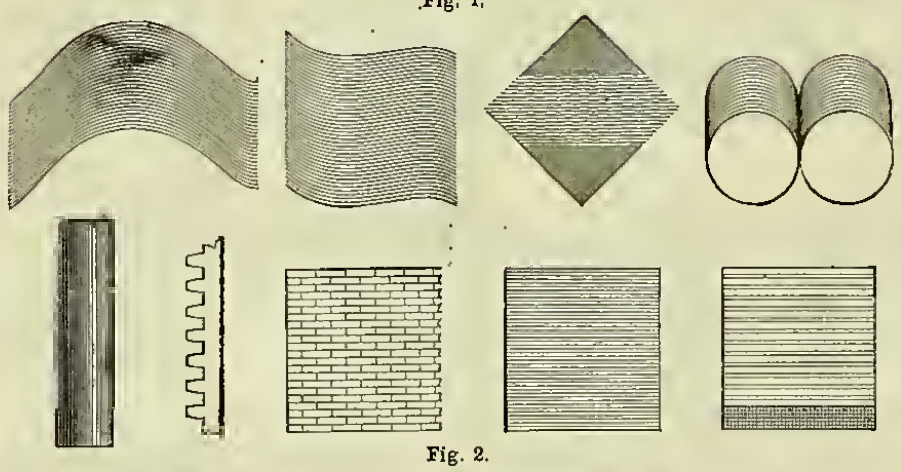


Fig. 2.

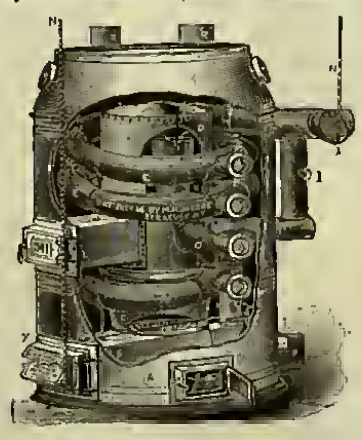
FROST & ADAMS' NEW RULER AND SECTION LINER.

The instrument may be used for drawing lines in any direction and at any distance apart, from one one-hundredth of an inch to any distance desired. In drawing parallel lines, the draughtsman places the ruler in the required position, and rules the first line. He then turns the shaft of the instrument toward him, by means of a rubber sleeve placed upon it, until he hears a click of the ratchet wheel, which is fixed upon the end of the shaft, and he then turns the shaft back a little until it stops. All the teeth of the ratchet are exactly equal, and the distance traveled by the wheels over the paper is always the same from one click to the next. When the lines are required at greater distances apart, the shaft may be turned to give two or more clicks. If they are required nearer together, the pivoted arm is fixed at an angle by means of the thumb nut and slotted quadrant, as indicated by dotted lines in the figure. For curved work, the ordinary French curve is attached to the ruler by means of the two thumb nuts in the center of the ruler plate, the lines being drawn with a right line pen, using the curve as a ruling edge.

In addition to the uses mentioned, this instrument may be employed for irregular lining and shading, setting out the spokes of wheels and teeth of bevel gears, shading cylinders, spiral springs, and screw threads. It is handsomely finished in steel and nickel plated brass, and will be found to quickly repay its cost, if only by the time it saves.

THE M. H. JACOBS CO.'S FURNACE.

With the large number of warm air and other furnaces now upon the market, those manufactured by the



above named company, of No. 96 West Fayette Street, Syracuse, N. Y., bear very favorable comparison. The arrangement of the details, and the strength and durability of the parts, render the furnace a most economical and serviceable one.

The general construction will be understood on reference to the annexed sketch, in which A represents the exterior casing, B the ash pit, C the fire pot, D the dome, and E the spiral radiator tube proceeding from the cast iron duct, G, in the lower part of the dome, and having its exit in the chimney flue, F. A shield, T, compels the flame and products of combustion to ascend to the top of the dome, by which they are deflected downward into the interior of the shield, as indicated by the arrows, thus causing the dome, and hence the radiators, to be thoroughly heated.

The advantages of such a system of construction are sufficiently obvious. A full description of the furnaces, which are made in five different sizes, may be had on application to the manufacturers.

THE GATE CITY STONE FILTER.

This filter consists essentially of two parts—an upper jar or chamber supported by a lower jar. The bottom of the upper jar is composed of a filtering disk, through which the water slowly finds its way to the chamber below. The filtering medium is a natural stone, having characteristics that perfectly adapt it for this work. The impurities in the water placed in the upper jar never penetrate the stone, but lie on the surface, so that the interior of the stone remains as pure and white after years of use as when taken from the mine. This feature insures the easy cleaning of the filter, as, by means of a brush and water all the impurities that have lodged upon the surface of the disk can be thoroughly removed, thereby restoring the filter to its original condition. Within the lower jar is placed an ice chamber, which is covered by a cap, so that there is no possibility of the filtered water being contaminated by any impurities that may be in the ice.

Every part of the filter can be easily gotten at for the purpose of cleansing; the disk is an efficient purifier, permits the water to pass slowly, and does not receive into its pores the impurities it extracts; the filter, considered as a whole, will last indefinitely; and there are no metals used in its construction. The filters are made of either china, glass, or brownstone

ware, in sizes varying from the traveler's portable china filter, which will purify a pint of water every two hours, up to those filtering twenty gallons per day. Physicians, chemists, and others who have used these filters recommend them as being in every way efficient and reliable.

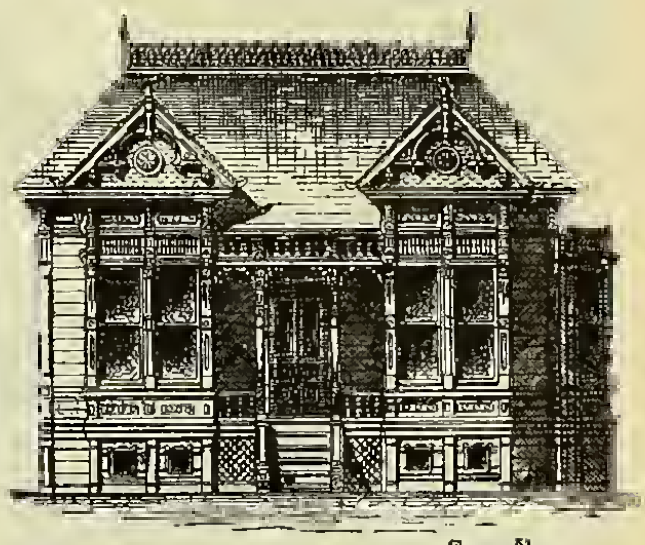
All further particulars can be had by addressing the Gate City Stone Filter Co., of 839 Broadway and 63 E. 13th Street, New York City.

AN EASTLAKE COTTAGE.

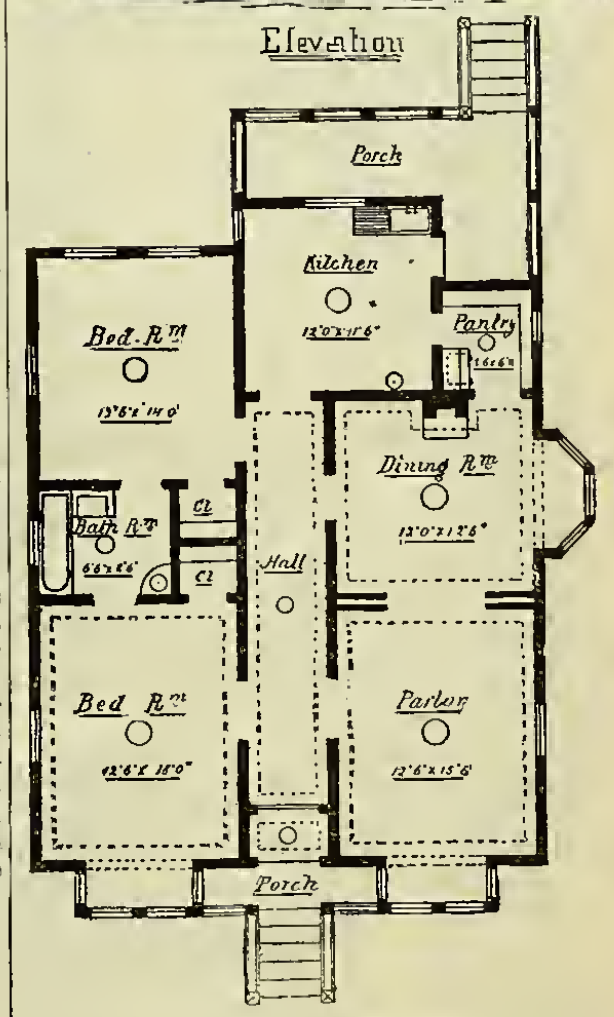
In presenting this design, attention is called to the compactness and beauty of arrangement of plans, well proportioned rooms, no unnecessary waste of space occupied by long, gloomy halls, and each door and window having its distinct purpose or cause.

The design, as illustrated, is a model of compactness and arrangement. On entering the hall from the vestibule, the parlor and dining room are situated on the right, separated by a neatly designed, paneled sliding door, and each room having a large bay window, with an ornamental arch. On the left of the hall are entrances to two bed rooms, with a bath room between them, and each room provided with a large closet with shelves, drawers, hooks, etc., usually found in closets.

The bath room contains a wash stand with nickel plated bibbs, and a Golden Gate plug water closet, finished in black walnut and nickel plated trimmings. The bath tub is provided with hot and cold water, through nickel plated bibbs, with attached soap cups.



Elevation



AN EASTLAKE COTTAGE.

The room is wainscoted five feet high and finished with moulded cap and paste board.

The floor should be covered with linoleum, giving the room a neat appearance, and making it easy to clean. The kitchen is provided with a sink, boiler, and a large paste pantry; and a commodious rear porch, inclosed by posts and railings, affords a good place to do washing, cleaning, etc.

The dining room is finished with paneled wainscoting, and all the woodwork finished in oak and highly polished. The dining room should be papered with some neat floral design, and the floor covered with a carpet harmonizing with the rest of the furniture.

The windows are furnished with sliding blinds, which slide in the casing, thus preventing the tearing of curtains and lambrequins. One chimney suffices for a fireplace for the dining room, and a separate flue for the kitchen. The elevation is of Eastlake style, and needs very little description, as a glance will show that it is neat in design, and solidly constructed. The roof is covered with the best quality of redwood shingles, laid four and a half inches to the weather, and well nailed. —*David Salfield, architect, Cal. Arch. and Build. News.*

THE NEW LAW COURTS, BIRMINGHAM.—ASTON WEBB AND INGRESS BELL, ARCHITECTS.—[For description see page 96.]

LOCAL BOARD OFFICES.

The illustration shows the design submitted in a recent competition for new local board offices to be erected at Brighouse. The building was proposed to be of stone from the local quarries, that to the main front being of ashlar, both to the plain wall surfaces and moulded work. The accommodation on the ground floor includes clerks' office, general rental office, committee room, waiting room, strong room, and lavatory, etc.; on the first floor, a board room, committee and waiting or ante room, lavatories, and book rooms. The front elevation was designed to harmonize with the adjoining building, belonging to the Halifax Commercial Banking Co., which building was designed and carried out under the superintendence of Mr. Geo. Hepworth, architect, Brighouse, by whom also the design for the building illustrated was prepared.—*The Architect.*

Wood Drying Experiments.

A very interesting series of experiments to determine the fluctuations of moisture in various woods during seasoning has just been closed, says the *Railway Review*, on the Chicago, Burlington & Quincy Railway, at the Aurora shops. The experiments are being continued, but the first series, the results of which we give herewith, ended in February, having been commenced December 21, 1885. The prime object of this work was to discover the laws of seasoning, if such laws existed, and thus to ascertain in what months the greatest amount of seasoning takes place, and whether wood thus seasoned reabsorbed moisture during the wet months of the fall and winter.

The work was undertaken in a very systematic way, and was done about in this wise: Three pieces of rough dressed oak, ash, and Norway pine, thoroughly green, were piled loosely, with cleats between, with a board overtopping all, in a situation where they were protected against drip and direct rain, but where they were open to rain, snow, and the sun on their sides. The conditions were, as nearly as possible, those to which lumber piled for outdoor seasoning is usually subject.

The seasoning, that is, the loss of moisture, began practically February 15, with all three woods, and ended August 2 with the ash and pine, but with the oak, October 11 seems to have been the finish.

The results with the oak were not altogether satisfactory to the experimenters. The second series of experiments will, it is hoped, throw more light upon this kind of wood.

From February 15 to August 2 the ash dropped from 29 to 12½ per cent, a loss of 16½ per cent. From August 2 to its finish, December 20, the fluctuations were between 12 and 14 per cent, the exact average being 13 27 per cent.

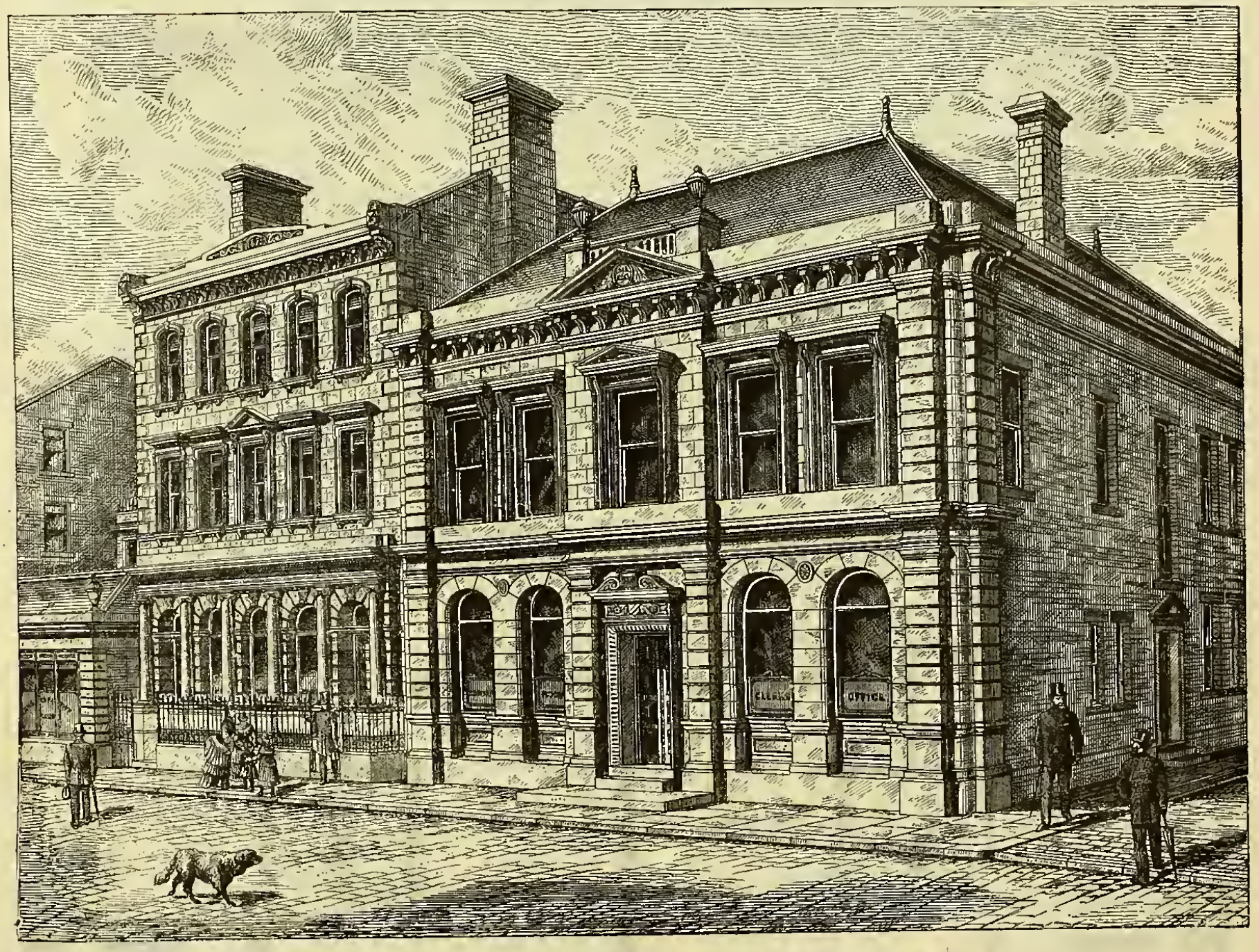
From February 15 to August 2 the pine dropped from 24 to 12½ per cent., a loss of 11½ per cent. From August 2 to its finish, February 28, its fluctuations were between 12½ and 15½ per cent. From October 25, 1886, to February 28, the exact extremes were 14·10 and 14·92 per cent, a difference of only 0·82 per cent. The extreme fortnightly fluctuation was 0·51 per cent. The average fluctuation was 0·30 per cent. The average moisture for that period was exactly 14·50 per cent.

These experiments cannot be taken at present as supplying infallible data, but in a general way it may be said that they lead to the conclusion that as regards oak, ash, and pine woods in a green condition, seasoning begins in very early spring (depending of course largely upon the kind of weather), and ends in midsummer. The provisional limits of this drying season may be fixed at the first of March to the first of August, in other words, including the months of March, April, May, June, and July. It has also been shown that, as regards ash and pine, after seasoning is effected, the wood will not take back water—that is, not beyond slight amounts during the wet and cold seasons. These conclusions are true only for the inmost parts of the woods in question, and of the sizes experimented upon. Variation in the character of the wood, condition at the time of cutting down the tree, treatment between that time and the first time of testing, sizes of pieces, etc., may alter the conclusions, although probably they would not materially do so.

The data which has been gathered in this way can be used to material advantage in many ways, notably, however, as an aid in the purchase of cars and in the purchase of timber. With the exact knowledge that it affords of the seasoning properties of different woods, and of the months during which seasoning is liable to be hastened or hindered, the guesswork of sellers of lumber and makers of cars can be readily checked.

Shrinking of Seasoned Timber.

The various kinds of oak, and some other kinds of timber, will shrink more or less every time the surface is dressed off, even a small fraction of an inch. Wheelwrights accustomed to the work are well aware of this fact, and a correct appreciation of it enables them to turn out work of a superior character, even of ordinary materials, by first blocking up the pieces roughly, then allowing the timber to season, and afterward working the various parts by degrees, as the seasoning process becomes more and more complete. White oak spoke timber, for example, may be allowed to remain in its rough state for half a score of years under shelter, without becoming seasoned so thoroughly that the timber will not shrink after the spokes have been dressed out. Carriage wheels have often been made of the choicest quality of oak timber, after every spoke has been seasoned for several years, and, to the great surprise of the wheelwright, every spoke would work in the joints before the vehicle had run three months. The defect in such instances could not be attributed to inferior timber, nor to perfunctory workmanship, but simply to this one circumstance—that the parts of the wheel were put together before the timber had ceased to shrink. To prove that the best quality of oak will shrink after a spoke has been dressed out, let a tenon be made on one end, and be driven immediately into a mortise. After a few days' exposure in a warm workshop, the spokes may be withdrawn with little difficulty. The same fact will hold good in the manufacture of woodwork of any kind where oak is employed for tenons. In order to make joints that will never start, the piece on which the tenons are made should be dressed several times, until the shrinking has ceased. Then let the tenons be made. After these have shrunk, while exposed to the drying influence of a warm workshop, the spokes or other parts may be driven in their respective places, with the assurance, especially if they are dipped in oil paint previous to driving, that the timber will shrink no more.—*The Woodworker.*



DESIGN FOR LOCAL BOARD OFFICES.—GEORGE HEPWORTH, ARCHITECT.

THE new boring at the Channel tunnel works at Dover has now reached a depth of 500 feet, and the operations, which are made with a view to ascertain whether the geological strata conform with those of the French coast, are being continued. No coal has yet been found, and the discovery of this is stated to be one of the objects of the boring.

A DOUBLE HOUSE OF MODERATE COST.

These dwellings were erected at Buttonwood, R. I., from the designs of C. F. Wilcox, architect, at a cost of $5,000.

SPECIFICATION.

Generally.—Execute the whole of the work in a good, sound, and workmanlike manner, with the best materials of their several kinds, to the entire satisfaction of the architect. Completely finish the house, in all respects, ready for occupation, and leave the same broom clean, with all rubbish cleared away.

MASON.

Excavate for cellar under kitchen to a depth of 6' 6" in the clear. Build water closet with raised cover for urinal.

Foundation Wall and Piers.—To be erected in Potter's best brick, 8"×16" under sills of the house, and 8"×8" under piazza posts, with stone foundation 2' under the ground.

Chimneys.—To be built as indicated on plans. All flues to he pargetted and plastered externally up to roof line. Flashings of 3 lb. lead to be placed around chimneys, and a clay pipe collar in kitchen and dining room.

Cesspool.—Form a cesspool 3' in diameter and 5' deep for waste from kitchen sink, and lay at a depth of not less than 2' 6" a 6" clay drain pipe to same. Form manhole and cover with flat stone. A dry well to be provided under basin in front hall.

Cistern of a capacity of 6,000 gallons to be provided with a 4" drain pipe from conductor.

Plastering.—All walls and ceilings to be lathed with spruce lath and plastered one coat of brown mortar, ceilings hard finished and walls same finish.

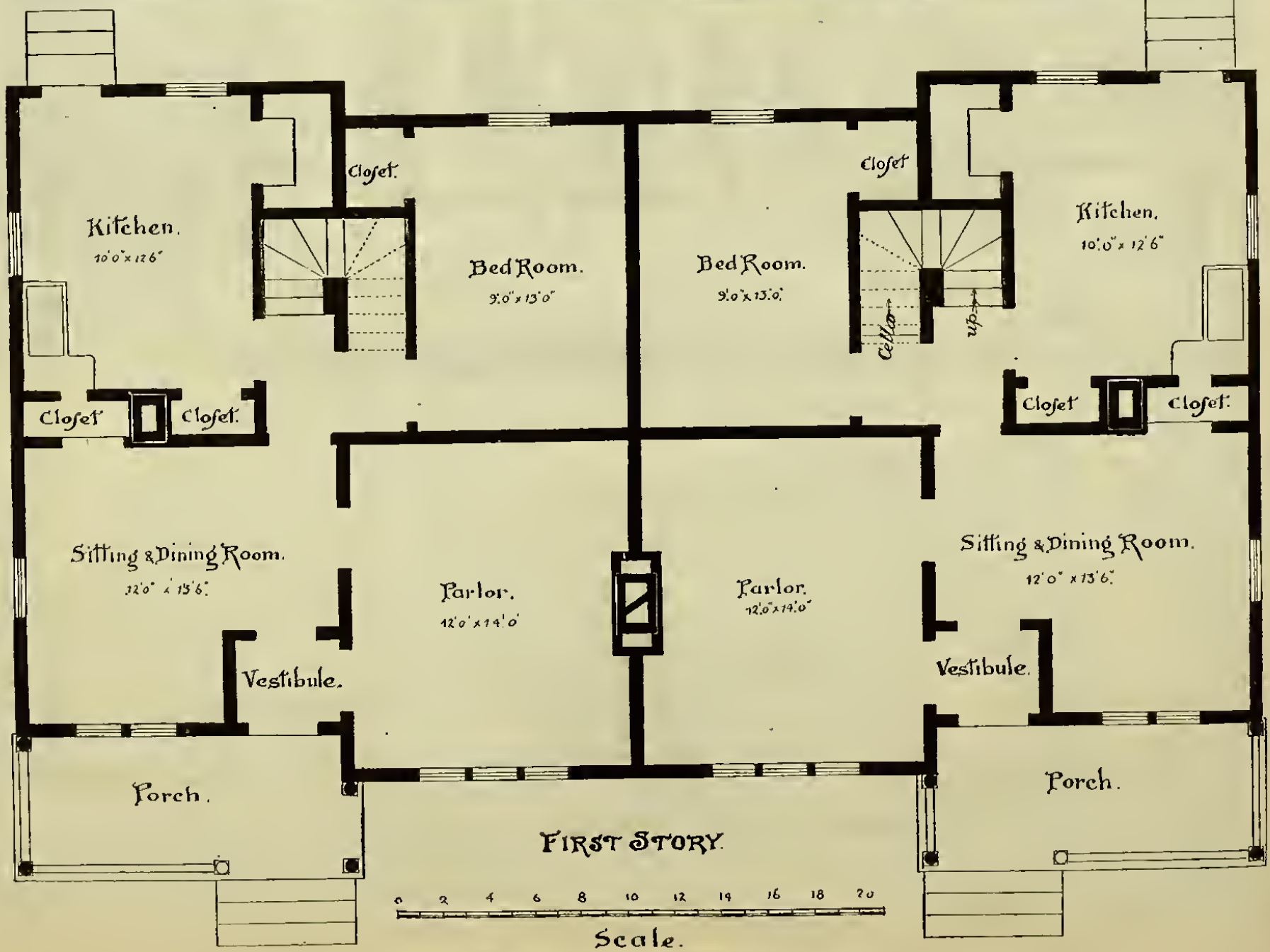
Cellar Steps to be of bluestone with brick risers.

CARPENTER.

Frame of house to be of best well seasoned spruce timber, boarded with hemlock. Trimmings and clapboards of first quality pine. Soffits and other parts not exposed to the weather may be of second quality stock if free from loose and large knots.

Shingles to be of first quality cedar, shaved on the roof and sawn on sides.

Gutters, etc.—The valleys, gutters, and piazza roof to be tinned with first quality M. F. tin. Conductors to be 3", of corrugated iron.



A DOUBLE HOUSE OF MODERATE COST.

Sashes and Doors.—The sashes, blinds, and doors to be as shown on drawings. Sashes and doors 1⅜" thick. Outside doors 1¾". Mortise locks and latches to doors, with white porcelain knobs inside; bronze to outside front door and door bell, and dark mineral to back doors. The front entrance door is to be hung in two parts rabetted together and with a bolt to fasten them.

Floors throughout the house to be of spruce, excepting in kitchen, servants' bed room, and closets, which are to be of hard pine. Piazza and balcony floors, 1⅛" matched hard pine. Ceiling over piazzas and balcony to be of matched and beaded pine.

Casings to doors and windows 4" moulded, and baseboards 6", with base on top edge.

Clothes Presses to be fitted with wardrobe locks and a shelf in each.

Stairs to be built with returned nosings, and to have 3" ash rail, 1¾" balusters, and 4" posts.

Wash Bowl.—Fit up around wash bowl a cabinet with recessed door beneath, and provide a marbleized bowl connected by lead waste to dry well beneath. Put on marble top with back and ends.

Sink.—Fit a 3' iron sink in kitchen, with a pump from well, and waste to drain pipe leading to cesspool.

Lattice.—Provide and fit around wash yard a lattice fence constructed of chestnut posts, pine strings and lattice. Fit lattice also under sills of house and piazza.

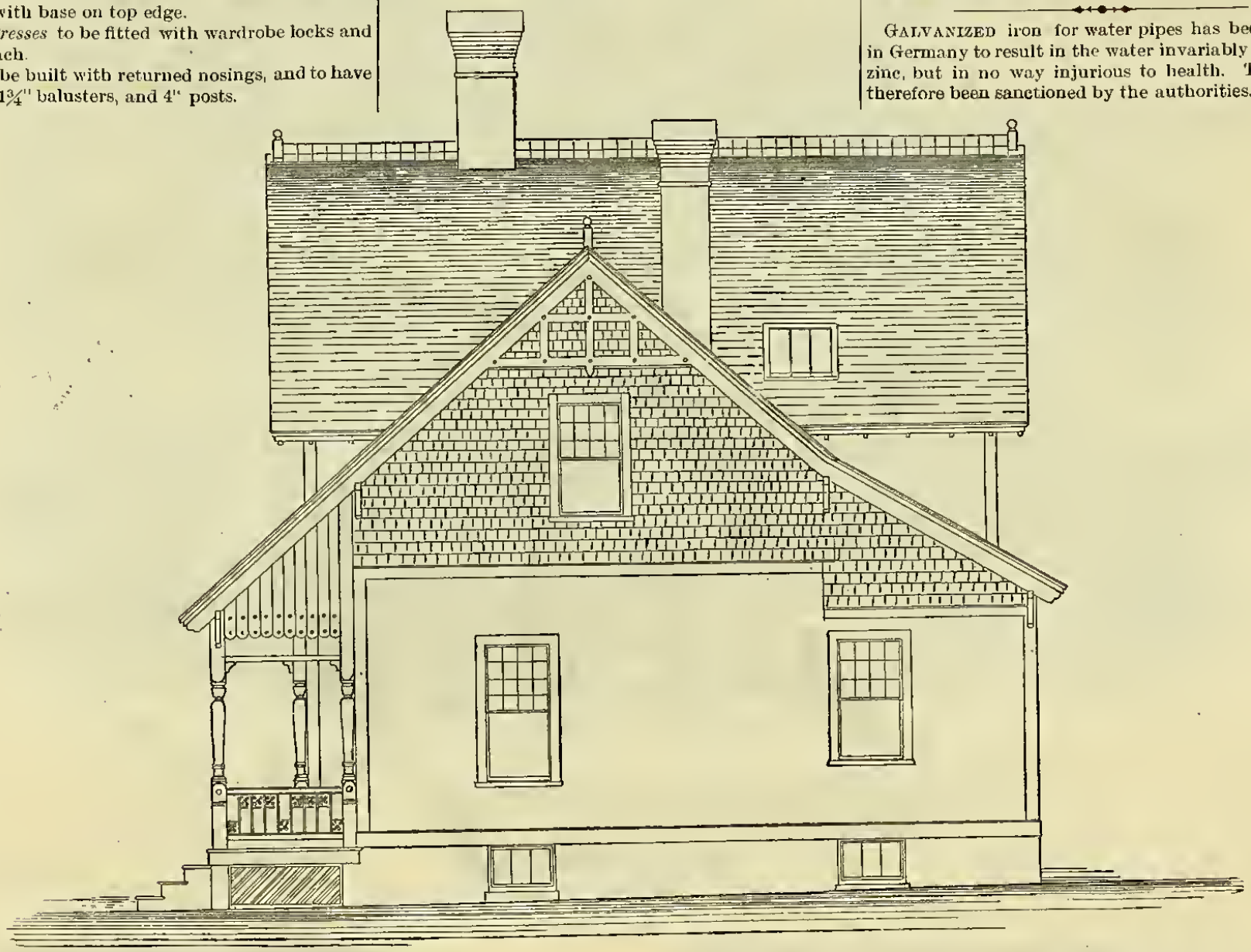
PAINTING.

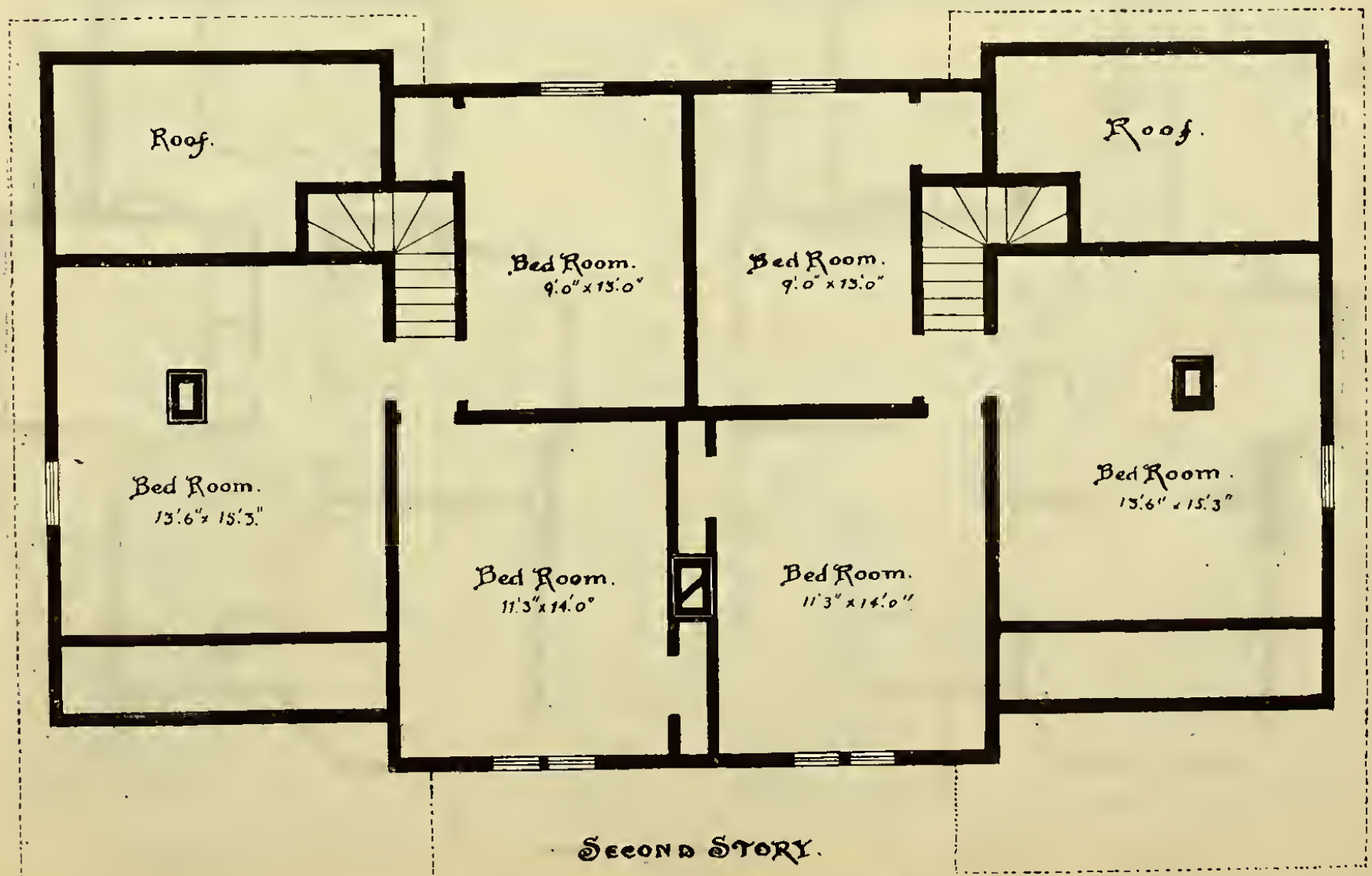
Exterior Work.—All outside work, excepting hard pine floors, which are to be oiled and well rubbed down, to be painted in three good coats, including the shingles. Conductors to have one coat of metallic paint and two coats of lead and oil, and tin roofs and gutters to have three coats of metallic paint.

Inside Work to have two good coats of paint on well prepared ground, knots and defects being shellacked and stopped as required. The whole to be finished in colors as directed. The hard wood is all to be three times shellacked and well rubbed down.

Generally.—Provide all labor and materials of the best and most perfect kinds necessary for the complete finishing of the building in all respects.

GALVANIZED iron for water pipes has been proved in Germany to result in the water invariably taking up zinc, but in no way injurious to health. They have therefore been sanctioned by the authorities.





SECOND STORY.

A DOUBLE HOUSE OF MODERATE COST.

A $3,500 COTTAGE.

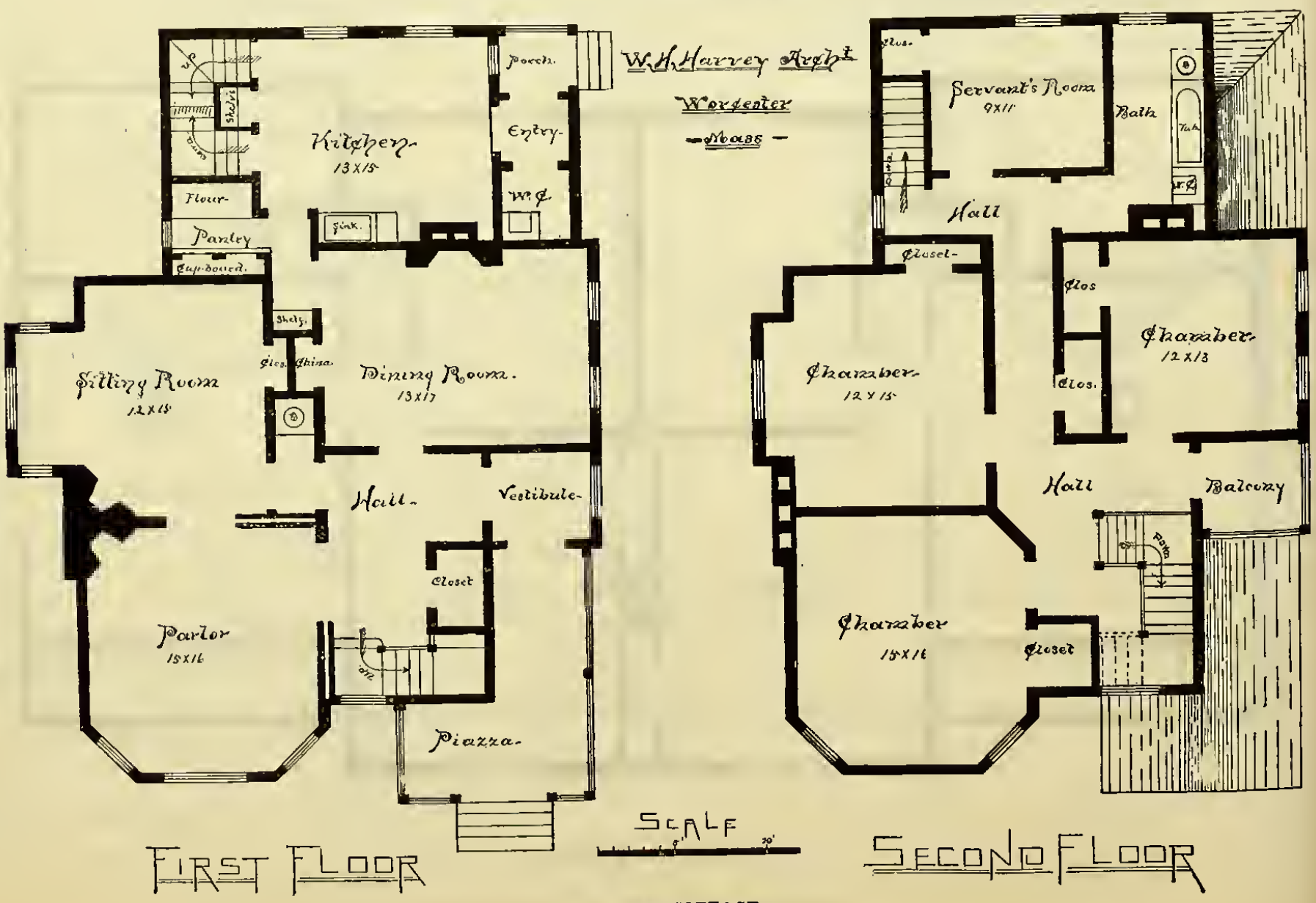
Exterior.—Foundation walls of stone. Under-pinning selected common brick. Cellar under entire house Height of cellar, seven feet six inches. Posts twenty feet long. First story nine feet six inches high. Second story eight feet six inches high. Attic unfinished, but will admit of three good chambers. Exterior frame sheathed and papered with building paper. First story clapboarded; second story and gables shingled. Roof shingled. Principal features, outside chimney, piazza, porch, balcony, gables, etc. *Interior.*—A pleasantly situated interior, containing eight rooms, besides hall, bathroom, and closets. The sitting room, parlor and hall communicate by means of sliding doors. The principal stair-case has landings and cathedral glass windows. The parlor has an art window in bay. The kitchen, back stairs and bath room are wainscoted, and the kitchen has a hardwood floor. The entire interior is finished in whitewood, except the stairway. The parlor sitting room and dining room have fireplaces. All interior woodwork finished on the natural wood. The first story of the exterior is painted three coats, and the second story three coats of creosote stains. Roof painted two coats of mineral paint.

Cement Buildings.

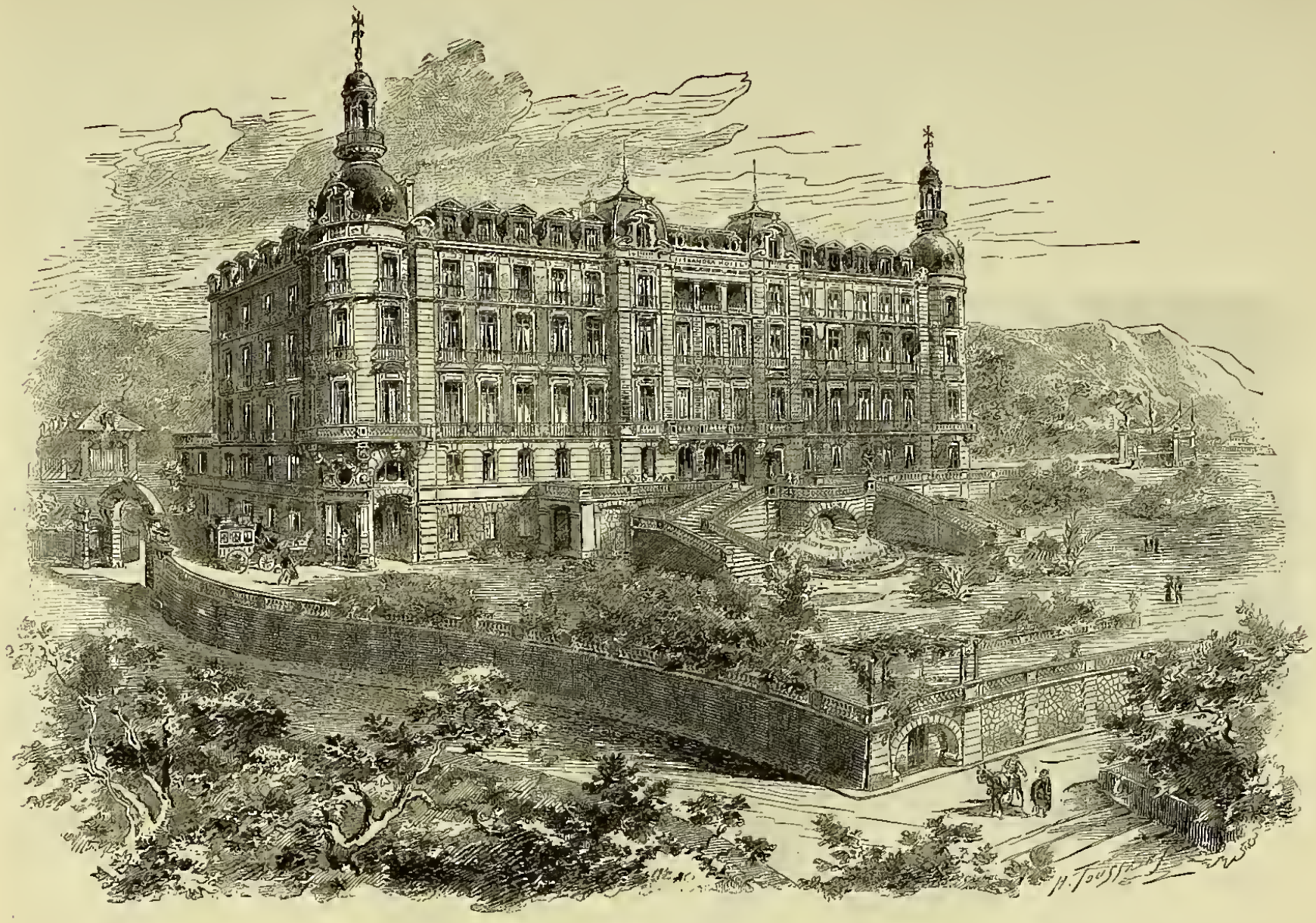
A rapid method of constructing buildings has been introduced by Mr. J. C. Bloomfield, of Blen-na-Lung Leggs, Ireland. He erects uprights, wooden or metallic, either with or without sole plates, and either directly on or sunk under the surface of the ground, or on dwarf walls of concrete or other material, and for roofs he uses wooden, metallic, or other suitable rafters, and on the inside and outside of the uprights or rafters he affixes wire or metallic ribbon strained across, and fills up the space with broken stones, shingle, burned clay, clinkers, cinders, or other suitable materials, and plasters the exterior and interior, or exterior or interior only, of the walls so formed with plaster, preferably with cement plaster, formed of Portland, Castle-Caldwell, Selenitic, or Scott's cement and sand or other suitable materials. Buildings formed in this manner with cement plaster are put up in exceptionally short time, and become quite dry and habitable in a few days, and fitted for immediate occupation, without any risk from damp.

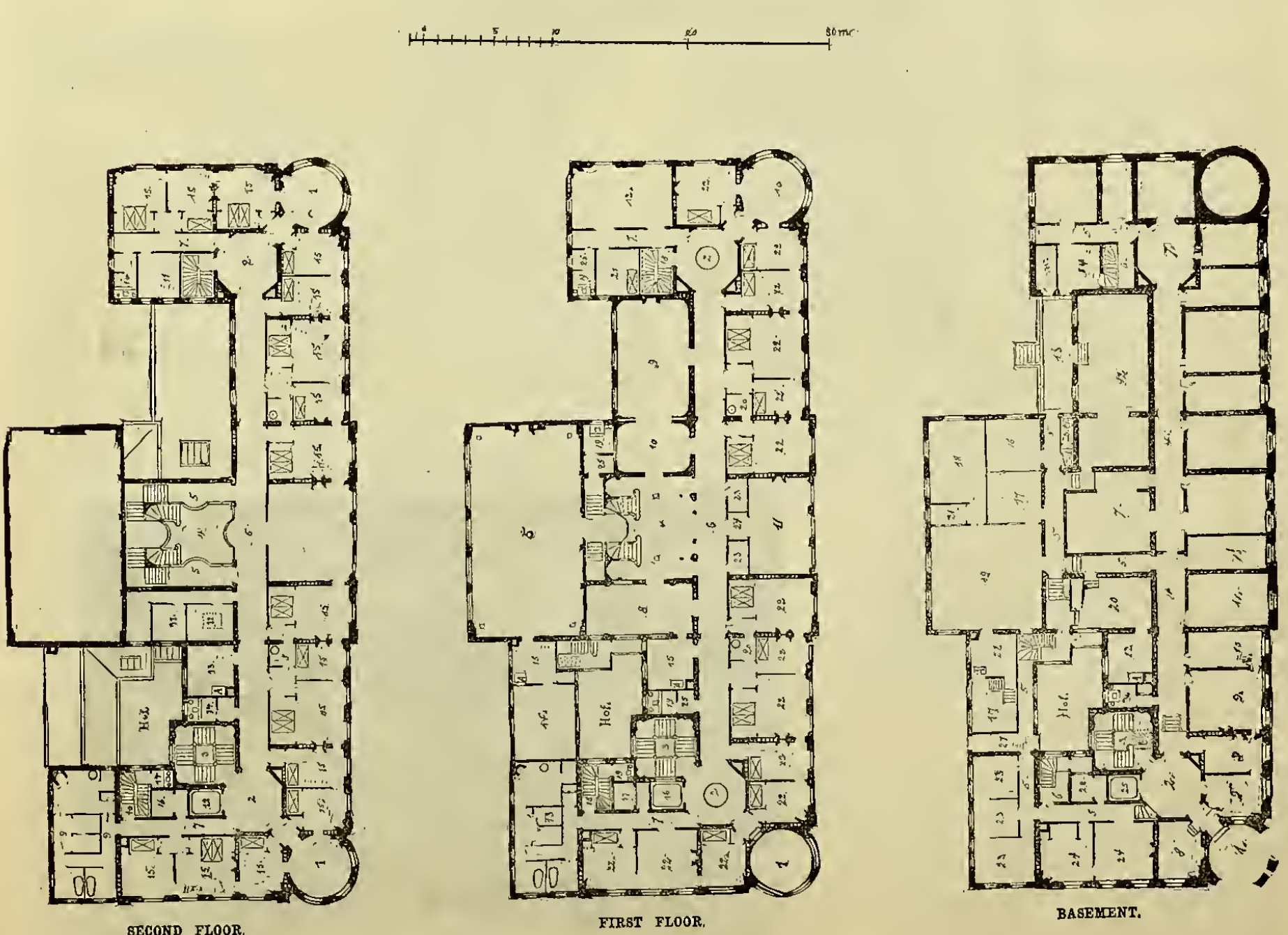
HOTEL AT MENTONE.

We give an engraving of a new and elegant hotel for 150 guests at Mentone, France, on the Mediterranean. This city is one of the favorite places of resort, especially for the winter months. The average temperature is 61° F. It is beautifully situated. The hotels and business part of the town are located near the water. Directly back of them rise the mountains, and here are located many beautiful villas and cottages. Mentone was one of the towns lately affected by the severe earthquake, which produced great consternation among the inhabitants.



A $3,500 COTTAGE.





SECOND FLOOR. FIRST FLOOR. BASEMENT.

HOTEL AT MENTONE.—A. G. RIVES, ARCHITECT, PARIS.

IRON CEILINGS.

During the past few years there has been a very decided advance in the construction of our buildings. The introduction of modern materials and apparatus has provided means of better and often less costly construction, which the public, as a rule, have not been slow to take advantage of. It is, however, a singular fact that we should hold on so tenaciously to the primitive and unscientific method of forming plastered ceilings. As a fact, the material has been in use so long that it is not easy to get the public to abandon it. On a very little consideration, it will be seen how many are the disadvantages of plaster which form serious objections to its use. The principal defect is its weakness. Let there be but a comparatively small vibration or jar in the building—to which, of course, every structure is more or less liable—or let there be a leak of water, and it will crack and fall off in patches, not only necessitating repairs in this respect, but forming a grave danger in the injury liable to be done by the falling material.

Fig. 1.—A CHURCH CEILING IN IRON.

Unsightly, cracked, broken, and patched plastered ceilings are only too familiar to every owner and occupant of a building, and the result has been the suggestion of innumerable plans by which a strong plastered ceiling might be produced. Among the methods which have been devised to this end is iron or wire netting to be used in place of wooden laths, but this, while improving the matter somewhat, possesses the serious disadvantage of rusting whenever wet comes upon it. It goes without saying that it is impossible to prevent water occasionally coming in contact with a ceiling. A leak in the roof, a broken water pipe, or water upset upon the floor happen now and again in all buildings. The result with iron netting in many cases is that after a few years the rust shows through, looking very unsightly, besides weakening the plaster, so that we return once more to our original position, with broken and cracked ceilings. But, even where the lathing is good and secure, there is another decided objection to plaster which is often overlooked. To incorporate it, a considerable quantity of water is necessary, and this water, during the process of evaporation, will fill the building with moisture. Now, all woodwork shrinks to some extent, be it ever so well seasoned, when fixed, and a skillful and judicious carpenter, who understands the effect of the shrinkage, will make due allowance for it in forming his joints, cutting them tight on one side and slack on the other, with the view of adjustment by the shrinkage. If, from the plaster or any other cause, the building should be filled with moisture, it will penetrate the timber, cause it to swell, and do considerable damage in splitting and cracking the woodwork. Without doubt, plaster is very unsatisfactory. What is required is not a change of *method* of construction, but an entire change of *material*, and in this will be found the only satisfactory solution to the problem.

The question of the decoration of ceilings is scarcely a less important one than that of the material used in their construction. Although there has of late been a successful attempt to treat the surface of ceilings in the more important buildings, still little has been done beyond either papering on the plaster or constructing paneled woodwork at great expense. Often a blank white expanse, they are not only conspicuously beautiless, but detract considerably from the decoration of the remainder of the room.

The material of the future for universal use for ceilings must be one which will be adaptable to the purposes of decoration and ornament, and which will substantially remove objections attendant upon the use of plaster. Such a material is iron, provided that it be properly treated. In many minds it is probable that the word iron in connection with the proposed use for ceilings suggests the idea of coarse corrugated sheets, nailed up roughly on the joists, with the nail heads appearing conspicuously, and with the laps and joints all showing. Used in such a manner iron would not be a success, but properly treated there is no reason in the world why it should not prove not only as substantial and as lasting a material as could easily be had, but, from the illimited variety of the forms into which it may be contrived, at the same time one of the most artistic.

Considering its merits first from the point of view of construction, iron would appear to be eminently well calculated for the purpose of ceilings. When formed into sheets with small corrugations, and properly fixed in such a manner as to permit of the escape of any water falling upon it, it will prove to be really a permanent ceiling, which will be essentially indestructible, which will not crack and fall off by jarring or vibration of the building, and that will neither stain nor soak off whenever there is a leak of water. Then it will prove of great assistance in preventing the spread of fire, and, if used with a lining of asbestos felt, will be practically fireproof. In recent reports of the New York Fire Department it was pointed out how great the danger is, on a fire occurring in buildings having plastered ceilings, by the manner in which the plaster falls off and allows of a draught through the floor between the joists. It was strongly recommended that all such ceilings should be rendered somewhat fireproof by the insertion of sheet iron between the floor and ceiling. If iron were used as a ceiling, of course the inside sheet could be dispensed with, and hence a saving be effected.

But perhaps the chief advantage of the material lies in its lightness, for it is in this fact that there is a very considerable benefit. An iron ceiling is approximately eight to ten times lighter than plaster, so that the supporting timbers may be a good deal lighter. Take the case of a church or other building having a roof area of, say for example, one hundred squares. An iron ceiling for such a building would weigh about 5 tons, while a plastered ceiling would weigh from 40 to 50 tons! It is not difficult to see how much safer the lighter ceiling would be.

As to the artistic value of iron as a material for use in the construction of ceilings, much might be said. In this city one firm have given some considerable study to the subject, and have manufactured it with a good deal of success. This is A. Northrup & Co., of 54 East 23d St., New York, and 23d and Mary Streets, Pittsburg, Pa., by whose courtesy we are enabled to present our readers with two engravings showing two separate descriptions of the treatment of the material. Fig. 1 represents a view of the iron ceiling in the Methodist church at Warren, Pa., and has quite a unique and certainly a very handsome appearance. The iron itself is crimped or rolled into very small corrugations and is then arranged in panels, the joints being covered with raised mouldings. At the corners of each panel are ornamental rosettes, covering the joints of mouldings. The large ornamental drops are blocked out from the ceiling, and form a special feature.

In Fig. 2 is represented the ceiling in the parlor of T. D. Miller, Esq., at East End, Pittsburg, Pa. This is arranged, as is usual, on a flat surface, by being skillfully and prettily divided up into panels, with the raised mouldings and rosettes as before. On some of the panels floral and other designs are painted, which, with the bold cornice of iron, produces a strikingly pretty effect. The crimp or corrugations are so small that when the iron is fixed in position they cannot be discerned. The only effect is to soften down the colors and to render the design much more artistic and pleasing.

Some sheets are corrugated right across, in various descriptions of crimp, while others are crimped differently on the corners to the remainder of the sheet. One of the most beautiful examples is a raised floral pattern thrown into relief by gilding, which, with the tinted and textured background alternated with plain tinted panels, looks very handsome.

One of the most attractive qualities of this material is its immense variety. The desire for novelty, perfectly proper as it is as a principle, is often carried to extremes in house building, and odd and often useless features are frequently added to the elevation, in the desire to make the house novel in appearance. Probably there is no better opportunity for variety than in decoration with iron ceilings. No two rooms are alike in their treatment, and further, and indeed limitless, variety may be brought about by using as many colors as may be desired in painting them.

In view of what has been said, it will be clear that the use of the material is not limited to any particular description of building. For ordinary dwelling houses, for stores, warehouses, factories, churches, halls, concert rooms, etc., it is equally suitable. It is manufactured from a plain crimp or corrugation to the highest stage of elaborateness and beauty. The small flutings serve with much benefit for acoustic purposes, which is an advantage of great value in schools, theaters, halls, and other buildings for public gatherings. On existing plastered or other ceilings it may be applied without difficulty, and a special construction enables it to be applied to T iron and all other descriptions of ceilings.

Of course the question of cost has an important bearing upon the merits of a material of this kind. Certainly it is somewhat higher than plaster, although not greatly so; but having in mind all its advantages, taking into account the saving of material in roof and floor timbers by the lightened weight, the time it will last, the little attention it requires, the assistance it lends in preventing the spread of fire, and last, but not least, the beautiful appearance it presents, there can be but little doubt that while it costs a little more at first, it is really far cheaper in the end.

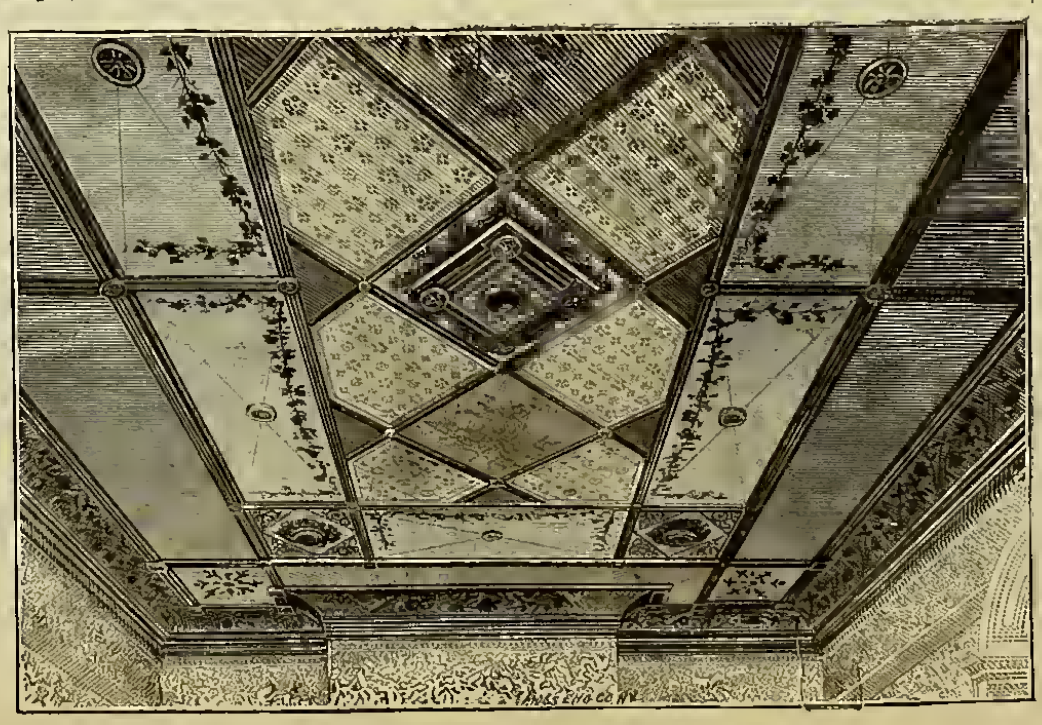
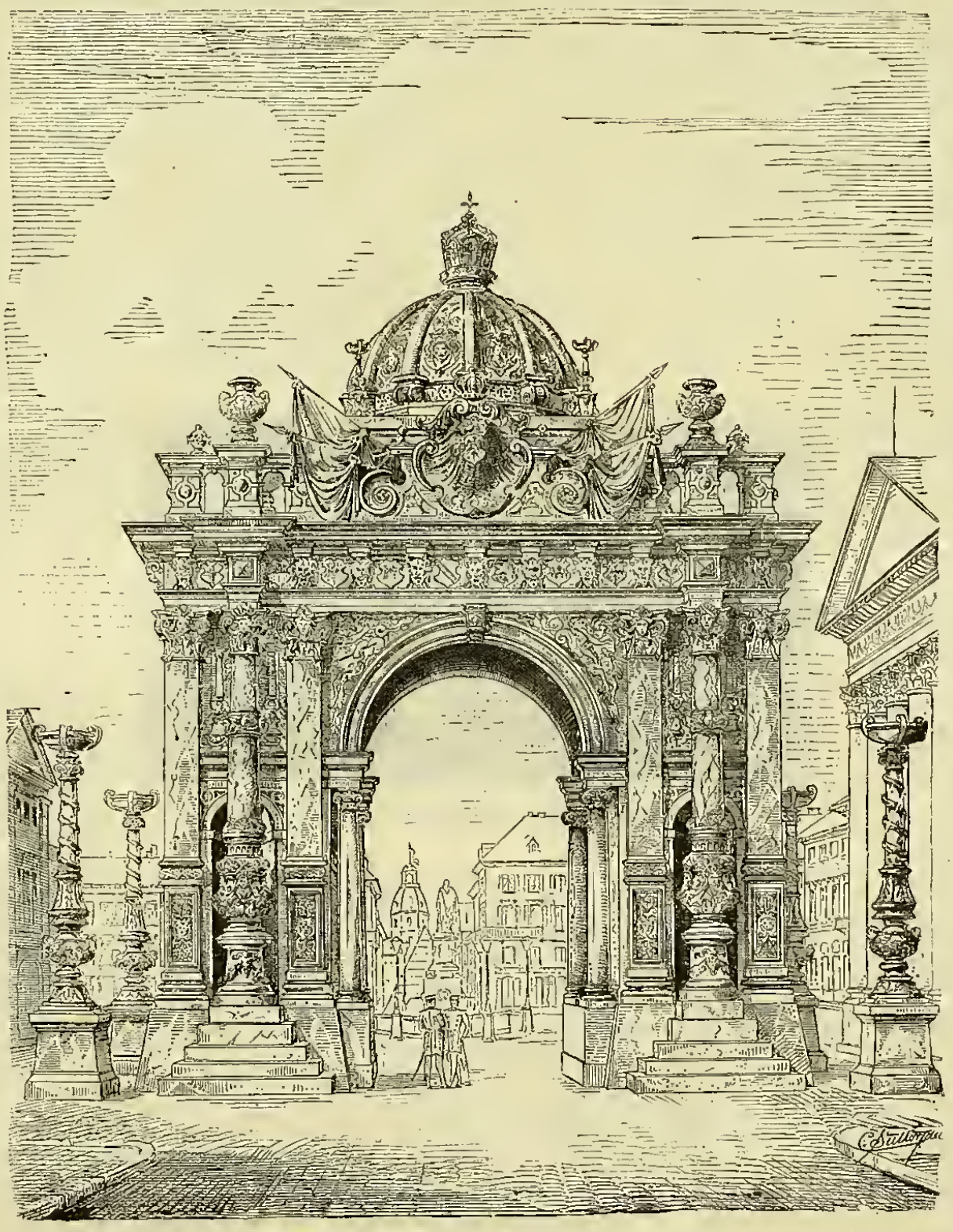


Fig. 2.—A PARLOR CEILING IN IRON.

The Acropolis of Athens.

Before the close of the fourteenth century the first Duke of Athens, Neri dei Acciajuoli, transformed the Propylæa into a palace, which he surrounded with fortifications, and of which he destroyed in all probability a considerable part, so as to change it into a princely habitation according to the ideas of the age. Up to this period the exterior of the edifice was in a good state of preservation, but the taking of Athens by Mahomet II., about 1456, and the effect of artillery already in use at this time, resulted in an almost complete destruction of the monuments of the Acropolis. Although the lords of Athens had previously erected numerous fortifications, it was necessary to strengthen them still further, in order to make the Propylæa, now the habitation of the Aga, and the only accessible point, secure from artillery which might be brought to bear against that structure. An immense bastion was therefore constructed in front, the approaches to the citadel were shut by a line of walls and gates, and the ancient towers and walls were buried 40 feet underground. The Parthenon became a mosque, the Erechtheion a harem, and, in their aversion to images, the Turks mutilated every piece of sculpture that came within their reach. In 1656, on the eve of a great festival the Turks wished to celebrate, the Aga Joussouf took it into his head to destroy the church of St. Dimitri, which is built in the plain at the foot of the Museion. With this object in view, he had three pieces of cannon planted, and ordered his soldiers to be ready on the following morning at break of day. This Joussouf lived in a great dome, constructed under the principal vestibule of the Propylæa, which was used at the time as a depot of arms and powder magazine. During the night a thunderbolt fell on this little arsenal, which exploded, and blew up the Aga and his whole family. The invention of gunpowder has been fatal to the monuments of the Acropolis. Thirty-one years after the above event the Venetians, who had just taken possession of the Morea, menaced Athens. The Turks, determined to make a vigorous defense, immediately set to work with the intention of fortifying still further the Acropolis and constructing batteries, one of which has been elevated on the ruins of the Temple of Victory, which indeed they ruined for the purpose. The Venetians, however, landed at the Piré and the Count of Konigsmark, lieutenant of Morosini, planted his mortars on the hills which surround the western side of the Acropolis. The bombarding commenced on September 26, 1687. The Partheuon, which commanded the platform on this side, and in which the Turks had shut up their families, was more particularly aimed at. The Turks had also placed in it all their most valuable effects and a large quantity of gunpowder. The bombs themselves would not have penetrated the solid roofing of the Parthenon, but sparks having got into the structure, the powder took fire, and the Parthenon blew up on the evening of September 28. Almost all the cella and its frieze, eight columns of the northern portico and six of the southern portico, with their entablatures, were overthrown—the vast temple was cut, as it were, into two masses of ruins. The Turks, terror stricken, surrendered the following day, and Morosini entered in triumph the Acropolis. By his orders the horses and car of Minerva, in such admirable preservation that the most indifferent traveler spoke of them with enthusiasm, were carried away; but the work was so badly conducted that the whole group fell, and was shattered on the rock. The captains of Morosini followed the example of their chief, and fragments of the Parthenon, according to the testimony of Bronstedt, were carried even to Copenhagen.—*M. Delecluze.*



ARCH OF TRIUMPH, KARLSRUHE.—DESIGNED BY PROF. HERMANN GOTZ.—*From Architektonische Rundschau.*

Architectural Excellence.

Architectural excellence consists in the judicious and skillful adaptation of an edifice to its specific destination and in the appropriate and tasteful display of its interior and exterior ornaments.

Every building of magnitude should be distinguished by decisive and positive marks of its purport. The church, the castle, the mansion, the jail, the temple, and town hall should each have its apposite characteristic form and features.

The Greeks and Romans were attentive to this principle; and the "architects" of the middle ages, though unrestrained by the rules and orders of their classical predecessors, very generally made a specific distinction between the edifice intended for religious worship and ceremonies and that appropriated for habitation.

A critical examination of the buildings of any country or community displays with a significant truth the character of the people who inhabit them, and is a sure indication of their manners and customs. This inquiry must be replete with amusement and instruction, if pursued with a single and unerring determination to ascertain the truth; but when employed in the course of theory, superstition, or any sectarian dogma, it is repugnant to reason and hostile to good sense.

The stately colonnade and decorated frieze of a Grecian temple or the rude and ponderous circles of Druidical customs can only be properly appreciated and understood by those who have diligently and scrupulously analyzed the history of the refined people who elevated the former to excite our admiration, or the mysterious beings who reared the enormous masses of the latter to awaken our astonishment. In the one instance we have detail combined with its proper assimilation to mass; in the other, we find mass without detail. Each is distinctive and has its own characteristics, and tells, without words, the character and habits of the people who designed them, and have left these monuments to tell their story to other ages.

Every object of nature and art that is inherently grand or beautiful is calculated to afford pleasure to the human mind. The sublime and towering mountain, the romantic cascade, the interminable and restless ocean, the broad and translucent lake, are all highly interesting and impressive; but these are the inimitable works of an omniscient Architect. Man vainly endeavors to mimic them, and advance the productions of art to vie with those of nature. Though, however, his works be comparatively small and insignificant, they often excite the amazement and admiration of his fellow creatures.

Genius aided by science can produce surprising effects—can furnish to the curious and inquisitive mind ample sources of study and delight. This is fully verified in the ancient architecture of Great Britain, as well as in the splendid and much prized edifices of Greece and Italy. It has long been the fashion, founded on prejudice, to praise the latter at the expense of the former; but the impartial historian and critic will award to each its proper and just share of excellence. Each style of architecture has its peculiar beauties, merits, and defects, and each will afford important lessons to the judicious architect; but the man who tamely and frigidly copies either will impeach both his taste and his judgment, and add but little to an "American style of architecture." We have many buildings where the architect has manifested both "genius" and "science" in their design and execution; where there is a happy blending of detail and mass. We find such in almost every city in our country—buildings that show the marks of careful study and a proper distribution of mass and detail. They stand out bold, plain and impressive, like a graceful and elegant female, dressed in a light and flowing drapery, as the latter adorns the former. We find such on our crowded thoroughfares, often surrounded with shady neighbors; but they resemble a dignified beauty accidentally surrounded and incommoded by a motley group of the rabble.

Finally: All buildings should, so far as it is possible for the architect to meet the requirements, tell their own story, whether they are intended for church or state, mercantile or other purposes; and in their uses much depends on the space that can or should be used to make them massive, or how much can be given up to light and airy detail. All structures must be massive enough to show that they are substantial, and the detail should, too, be in keeping, being bold, clean, and impressive, and all having a meaning.

If the designer's pencil did not run so easily into graceful curves and lovely flowers, that look so beautiful in the picture; if its point would get directed to bolder, but subservient, detail to the mass, those structures would have a lasting appearance and enduring character, that would speak for a nation's grandeur, and perhaps in the future it would lead to an American style of architecture.—*L. D. Cleveland.*

Artificial Rubies.

At the Academy of Science's meeting held on March 14, M. Fremy read a memoir on the researches which he has made with M. Verneuil to artificially produce ruby. An alumina crucible was used, so as to avoid the presence of silica, which has the effect of imparting a lamellar structure to the product. Under such conditions, with alumina separated from calcium fluoride by a perforated platinum septum, they have obtained perfect crystals of alumina, which, being colored with traces of chromic acid, were an exact counterpart of the natural stone.

ROSE COVERED PORCHES.

T. W. GIRDLESTONE.

How is it that plants are often seen flourishing in cottage gardens with a luxuriance which seems unattainable in gardens where all conditions appear to be so much more favorable? The great masses of hepaticas, for instance, in the cottagers' gardens in some of the western shires are unsurpassed, while the clumps (sometimes almost forests) of madonna lilies are the envy of passers-by, and the climbers by which the cottage is often half hidden seem to grow with more enjoyment than anywhere else. Perhaps the reason may not be further to seek than in the employment of materials well suited to the climate and conditions, for there is no doubt that common plants well grown are more decorative than half starved specimens of more brilliant things, for whose proper cultivation the requisite means are not attainable; and a cottage porch smothered with honeysuckles and some old fashioned rose is about as pleasant a sight as can be seen, in spite of the climbers being neither rare nor costly. But the supposition that the denizens of cottage gardens are so fine because they are indigenous or exceptionally hardy plants is not sufficient to account for the handsome subjects there so often met with. The finest Catherine Mermet I ever saw was climbing on the chimney of a cottage by the roadside in Surrey, and in a similar position in another part of the same county I have seen blooms of Gloire de Dijon such as I have never seen elsewhere, even in celebrated rose gardens. Every one will doubtless recall Canon Reynolds Hole's description of the noble specimens upon the walls of a cottage of the glorious but hardly-to-be-flowered Noisette, Cloth of Gold, which so rarely gets sun enough to ripen its shoots in this climate, and even more rarely succeeds in preserving them uninjured until the flowering time. I myself have experienced the pangs of jealousy when passing a house masked with a climbing devoniensis in full bloom, the cultural attention to which consisted in its being occasionally gone over with a long handled bill hook, such as is used in trimming hedges, "just to keep the shoots from rattlin' on the windows."

In spite of these seemingly anomalous instances, however, the real reason of the presence of striking specimens in cottage gardens will probably be found in the fact that, not being too numerous, each plant is tended and looked after with the greatest care. The precious and carefully collected road scrapings, not having to be spread over too wide an area, are heaped round special favorites to provide at once food and protection, and thus is encouraged that luxuriance of growth which renders possible the rose covered porches of our Surrey cottages, whereby a pleasant feast of brightness is afforded to weary travelers passing by.

CLIMBING ROSE ON PORCH OF COTTAGE.

It is remarkable how seldom the white rose (double or garden variety of Rosa alba) is to be seen in any but cottage gardens, and the same may be said of its near relation, the maiden's blush. Such good roses, capable as they are of highly ornamental treatment and so individually charming, certainly deserve more general culture than they receive. The white rose does equally well as a bush five feet to six feet high, or as a low climber. The cottage porch we engrave shows it in the latter form, trained to meet a honeysuckle in the front, the training not overdone, but with that happy knack of supporting and guiding without apparently constraining, that best shows the beauty and natural growth of rambling plants.

ROSE ARCHES.

The mode of decorating our gardens with arches of roses carried over paths seems of late years to have gone very much out of fashion, although roses so grown may be made to constitute a very attractive feature, a fact to which an engraving in a recent *Garden* abundantly testifies. It has been urged that rose arches are always ineffective or inconvenient, and generally both; but if so, the reason is probably to be found in a want of skill in the cultivator or constructor, or both. For there is no design that is safe from being made to appear ridiculous through its attempted execution in ill chosen materials. A house built of bricks and stucco from designs intended to be carried out in stone would not be more grotesque than the gaunt iron arch one sometimes sees with a stunted rose bush growing half way up each of its pillars. Such an arrangement certainly is ineffective, but then it is not a rose arch. Where there has been a want of success in making rose arches decorative, the failure may usually be attributed to one of two causes—either an attempt to furnish them with roses entirely unfitted for the purpose, or the employment of too many varieties. The number of available sorts is not large, and perhaps a dozen names would exhaust the list of first rate kinds, but the employment of these or any twelve different roses upon some half a dozen arches would effectually preclude the possibility of anything like a fine display. On the other hand, what could be more striking than such a series of arches, each arch densely wreathed with the evergreen Felicite perpetuelle, probably the best of all varieties for the purpose, with its rampant growth, its dark green persistent foliage, and its myriad pure white flowers, each one a perfect rosette? If numerous varieties are employed, the result is seldom satisfactory from a decorative point of view, because the different sorts will not flower at the same time; but this difficulty is obviated by using only one variety at a time, whereby the striking effect obtainable by having a number of arches of roses simultaneously sheeted with bloom is insured.

In case of the employment of several varieties on a series of arches, each arch, at any rate, should be covered with one rose, and not have two different kinds planted beside its two pillars, so that at the flowering time each arch, at least, may be complete, rather than have one half blossoming while the other half is green or bare. Even if they can be induced to bloom at the same time, unless they are of the same class and habit, the effect of two different roses mixed up together is generally somewhat incongruous and unpleasing.

In the selection of varieties, the qualities to look for, in addition to the obvious essentials of rampant growth and profusion of bloom, are hardiness, pliability, persistence of foliage—which foliage should be handsome, but only of moderate size, as the very large leaved roses, when grown on arches, get their leaves so lacerated by the wind and soon look untidy—and comparative freedom from the more disfiguring of rose pests, such as mildew, etc. In addition to Felicite perpetuelle, which is unsurpassed as an arch rose, there may also be mentioned as fulfilling the above conditions the Ayrshire splendens, whose white flowers, less regular in outline than those of the last-named, are relieved by a slight pink edge. These two varieties are the pick of their respective classes, but if a pink variety in the same section be desired, there is no fault to be found with the hybrid Laure Davoust, whose charming pink flowers are produced in immense clusters, except that in the north it is not quite hardy enough to avoid some disfigurement in a severe winter, unless it be somewhat protected with bracken, or such covering. In the southern counties, however, both this and the climbing Aimee Vibert, or Aimee Vibert scandens, as it is sometimes pedantically called, make good arch roses, and the two are sufficiently near in character to make a good pair, the one pink and the other white, where several sorts are desired. But when it comes to the noisettes, there are two varieties of which use should be made whenever possible; for if not perfectly hardy they are well worth the slight protection of fern, which renders them so. The first of these is Reve d'Or, an exceedingly vigorous rose and the hardiest of its class—a rose which could not be considered otherwise than a highly ornamental plant, even if it never flowered, for its young shoots are brilliant red, and the handsome foliage is rarely without some bright tint; but its character does not belie its name, and the wealth of golden and tawny blossoms displayed constitutes truly enough a vision of gold, and not a fleeting vision like an every-day dream either, for the flowering only ends when the frosts begin.

The second variety is the now well known and deservedly popular William Allen Richardson, not so rampant as Reve d'Or, but quite sturdily vigorous enough for all practical purposes, and very nearly, if not quite, as hardy as the latter. At any rate numerous plants of William Allen Richardson of various forms passed uninjured through the trying winter of 1885–86 with only the slight protection of a few fronds of bracken twisted among them, which all teas and noisettes deserve, and are the better for in hard weather; and, as far as can be seen at present, the long spell of cold now coming (it is to be hoped) to an end, although the thermometer twice registered upward of 25° of frost, has not inflicted appreciable injury on plants of this delightful noisette, whose decorative value is enhanced by the fact that the bright orange color of its flowers is unique among roses, while the plant is almost evergreen and thoroughly autumnal.

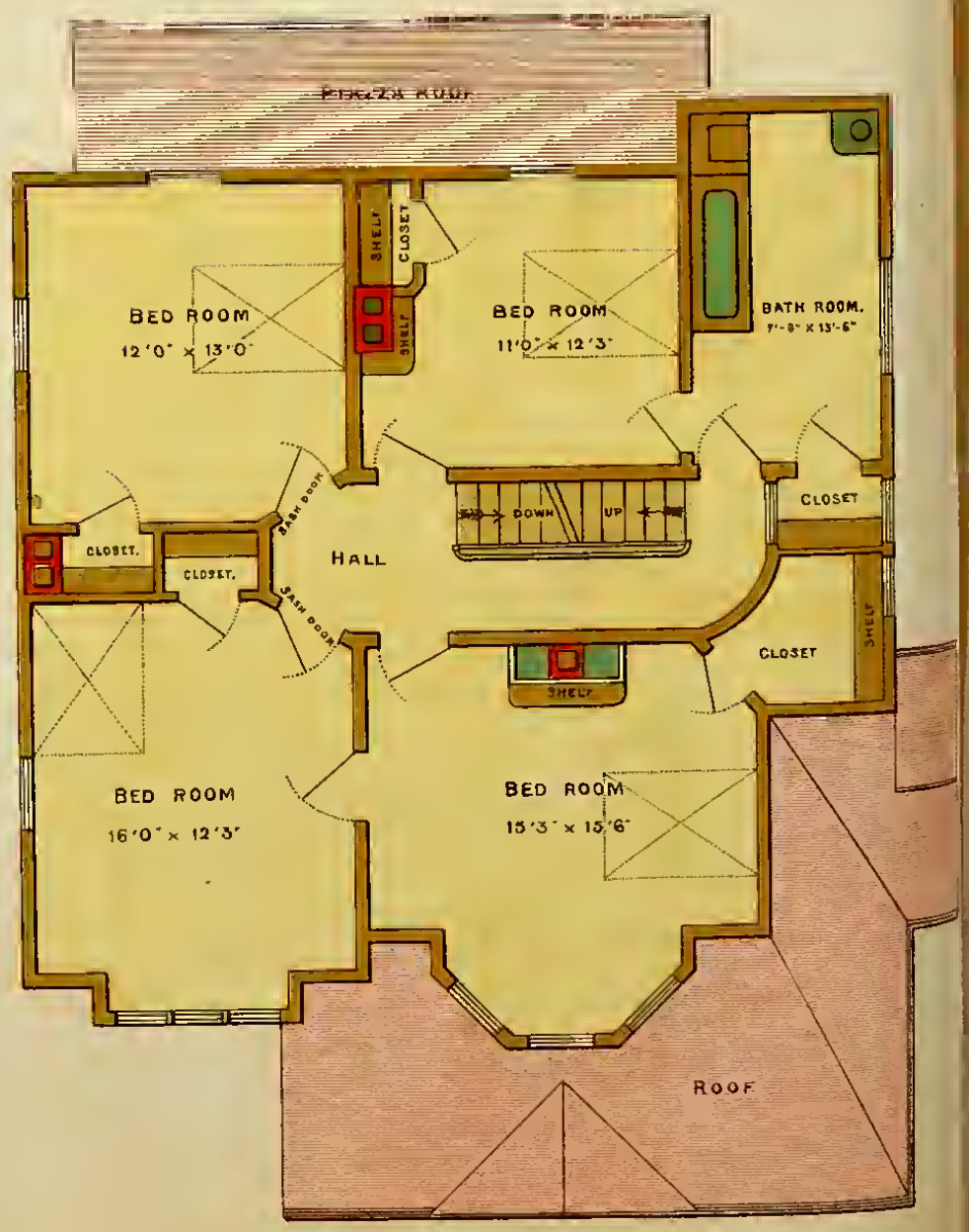
Red roses that are available for training over arches are few and far between, but the hybrid tea Reine Marie Henriette is a first rate variety for the purpose, and, growing with immense vigor, produces its bright, clear red flowers in abundance throughout the season. The attractive semi-double red hybrid tea or hybrid noisette Reine Olga de Wurtemburg, which was figured in the *Garden* early last year, would make an admirable arch rose, but for the solitary objection that its magnificent foliage is liable soon to become "tattered and torn" by the action of the wind when this rose giant is grown anywhere away from a wall. But a lack of good hardy red climbing roses is no reason for ignoring good hardy climbers that are ready to hand, even though they be not bright colored; and there are two single roses which are both better worth growing to cover arches than all the hybrid perpetuals so often recommended put together. One is Rosa brunonis, often called the Himalayan brier, which makes incredibly long shoots, enough to furnish an arch in a single season, and of which the pretty bluish green foliage is almost hidden at the flowering time by the mass of snowy single blossoms. The other, last, but not least in value at any rate, is Rosa polyantha, a Japanese sub species of R. multiflora, and one of the most attractive roses in cultivation. It has all the recommendations enumerated above. It grows with the utmost luxuriance, and regularly becomes smothered with blossom. M. Jean Sisley, of Lyons, declares his belief that it is the hardiest rose in existence. It may be easily trained in any direction. The foliage hangs on late, and though composed of many leaflets, the leaflet is not large, and the plant appears almost exempt from mildew. Moreover, it will grow in any soil or situation, and roots as a cutting with the greatest readiness, and its white flowers, though individually small, are produced in such immense trusses as to be highly decorative, while their delicious fragrance scents the air for yards round a large plant in blossom. Under these circumstances, the only wonder is that this plant is not abundant in all gardens where roses are appreciated; but the fact probably is, that too many gardeners still consider single flowers a reproach to a rose, which no other merits can compensate.

There are many other roses which are often included in lists of kinds said to be desirable as arch roses, such as the Boursaults, which, however, cannot conscientiously be recommended on account of their dreary coloring. Again, the charming rose which goes under the name of Fortune's yellow is too tender to be grown in this country anywhere but against a wall—a position which it thoroughly deserves; and the same may be said of the banksias. None of the mosses are of real value for the purpose. Lanei is the only one of sufficient vigor, and that is too stiff and rigid to be ornamental. One or two hybrid chinas, such as Blairi No. 2, may be employed, but all the hybrid perpetuals practically involve an outlay of time and trouble by no means repaid by the effect produced; while the few gallicas, etc., that might possibly be available are such victims to mildew as to be hardly ever otherwise than an eyesore.

In arranging rose arches it must, of course, be borne in mind that it is essential that things intended for use be eminently usable; and if arches are made across a path, care must be taken that they do not make such path inconvenient for traffic. Thus, the pillars of an arch should be at least three feet from each margin of the walk spanned, in order that the dresses of passers-by may be safe from the thorny shoots; and if the walk be six feet wide, this will give a base of twelve feet wide, for which a central height of ten feet will be found to give an effective and practical arch. Where there is to be a series of arches, they should be at least three yards or four yards apart, and each arch should be composed entirely of iron, for if the uprights be made of wood they soon give way at the ground line, especially when the plants trained upon them become vigorous and offer considerable resistance to the wind. The only objection to iron uprights is that from their smaller diameter they are less convenient to train plants to than wooden posts; but any difficulty arising from this may be obviated by fixing a few horizontal cross bars on to the iron uprights, and to these the rose shoots can be tied so as to avoid undue crowding in the earlier stages of growth. The best way of planting is to put in two trees of the same kind, one at the foot of each upright, and then by liberal culture to encourage the most vigorous growth possible; but if a variety is used which does not furnish well, there is no reason why two or three plants of it should not be planted at either pillar in order to get the arch more completely wreathed. Then, if varieties well adapted to the purpose be employed, the shoots from the two sides will soon meet across the center, and, interlacing, form a triumphal arch or series of arches.—*The Garden*

THE COTTAGE (SHOWN IN APRIL NUMBER) AS ENLARGED.

Plan of First Floor.

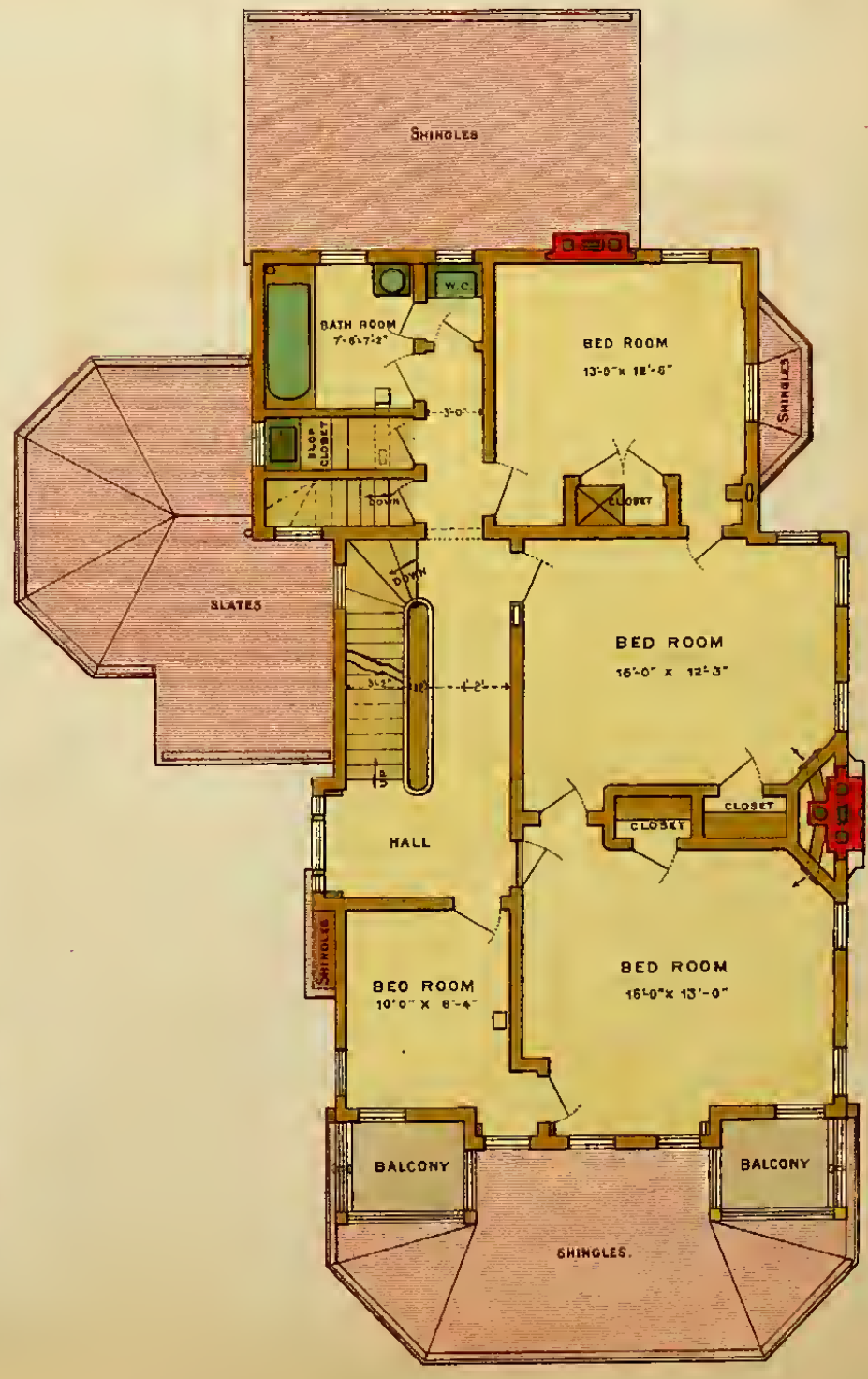


Plan of Second Floor.

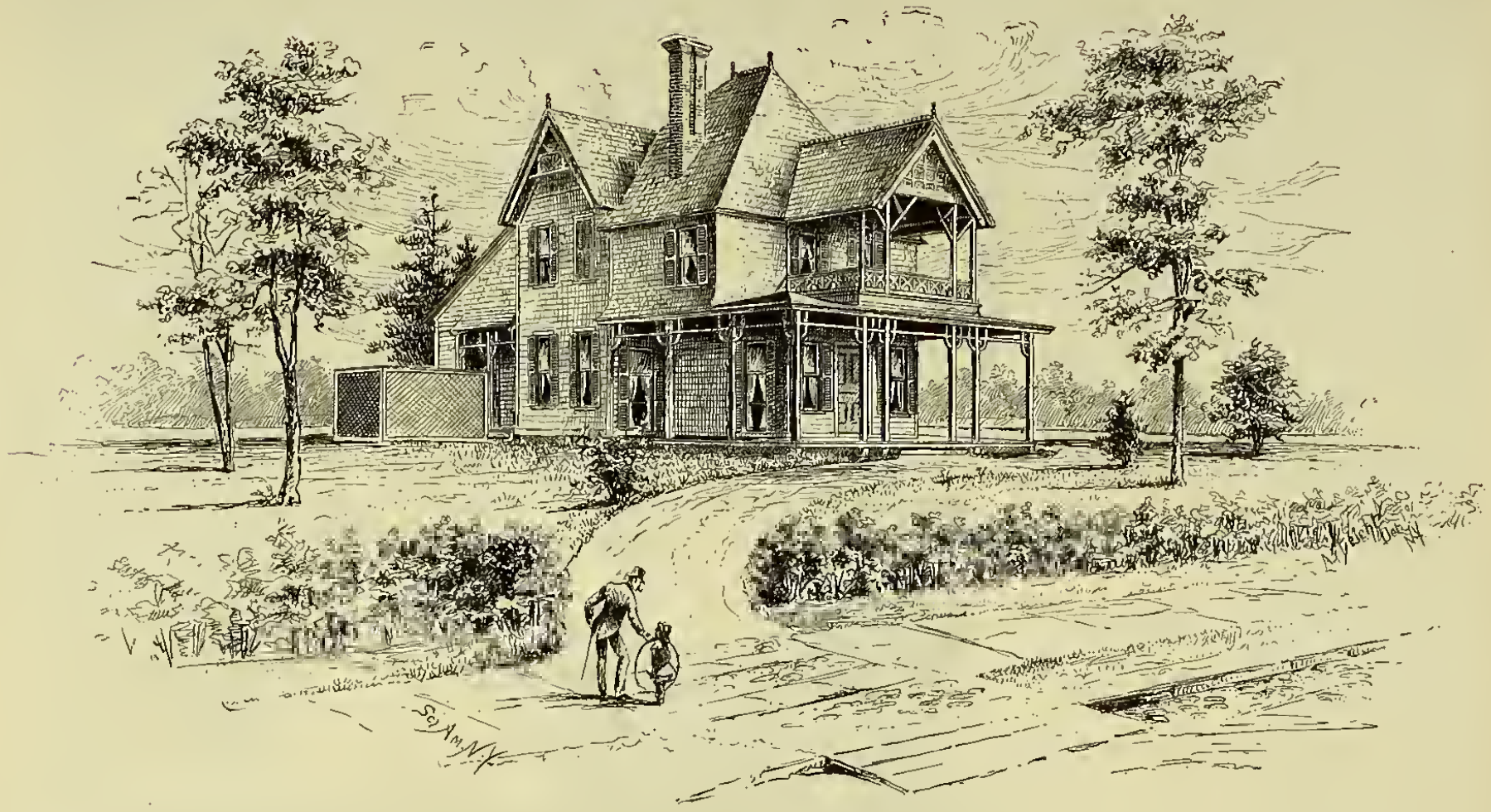
SCHUMACHER & ETTLINGER, NEW YORK.

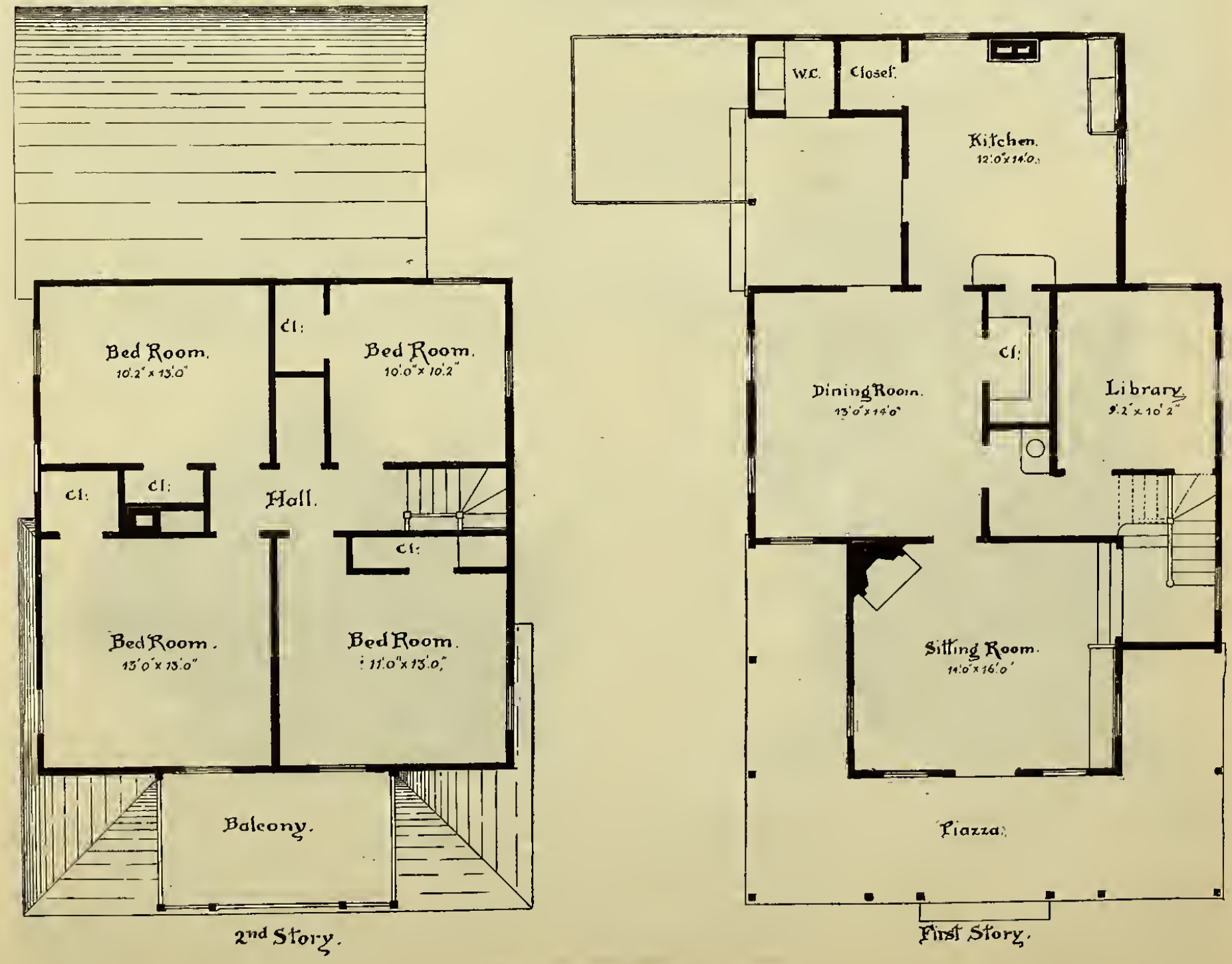
A DWELLING AT ORANGE, N. J.

Plan of First Floor.



Plan of Second Floor.





A DWELLING OF MODERATE COST.

[For description see page 118]

RAISING THE OLD UNITED STATES COURT HOUSE IN BOSTON.

This building was originally the old Masonic Temple, built in 1832, in rather heavy Gothic style, a view of it in outline being given. It was was 60×80 feet in plan, with a heavy tower 16 feet square and 95 feet high at each angle of the Tremont Street front; was five stories, and was lighted by long arched windows on the sides. The walls were of granite, 22 inches thick on the average, and the weight to be raised, as hereinafter described, was estimated at nearly 1,500 tons.

After serving as a court house until the court was removed to the post office block, the building was sold, and the new owners desired to fit it up for business purposes. The 80 foot front was on Temple Place, which had been widened several years before, so that the building projected three feet over the new street line. At that time the owners charged so high a price for damages that the city declined to pay the sum. The present owners, therefore, feared that should they demolish the building they would be obliged by the city to adopt the new line; and, in order to save the 240 feet of ground space, they adopted the expedient of raising the old building and inserting girders underneath and iron columns for the store fronts. The line separating the part raised from that removed is indicated in the perspective diagram, the raised portion being about 36 feet high.

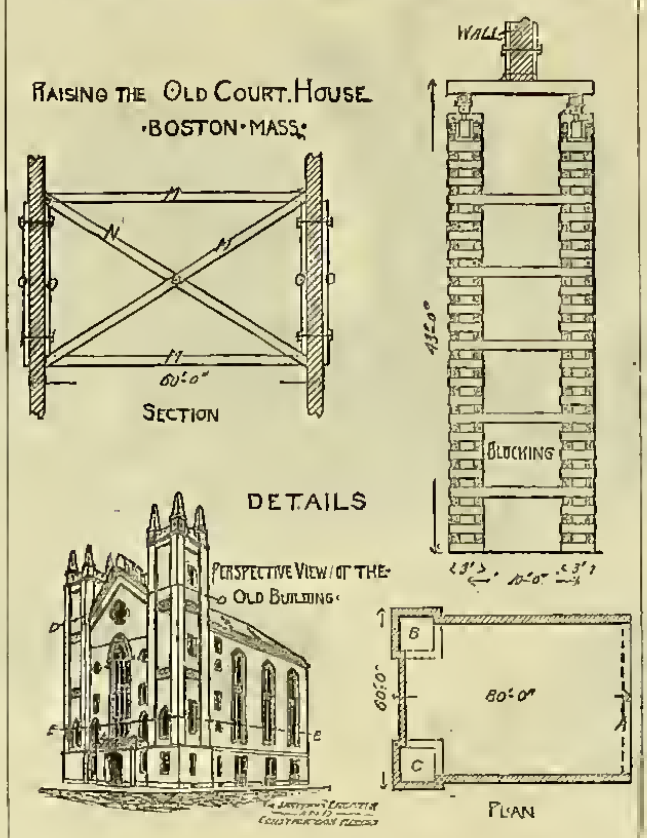
The contractor for the work was Mr. Issac Blair. The original design was to cut down the towers to the level of the roof, remove the interior work, and raise the exterior walls and towers intact.

After beginning the work, however, the contractor decided that as the rear wall (A, see small plan) had to be removed to take in an alleyway at the rear, and as the interior portion, B C, of the towers had a comparatively slight bond with the exterior, these might better be removed.

This resulted in dividing the building virtually into two halves, since the window at the front ran nearly to the peak; and it was noticed as the work progressed that any inequalities in raising of the two sides was indicated by opening and closing of the joint at the key of the arch above this window. It will be noted, also, that the side walls were divided into nearly separate portions by the long windows in them. To insure the stability of the whole, long timbers (M, see sketch) were braced from wall to wall with diagonals (N) in a vertical plane between them. The diagonals were bolted at their intersection. Timbers were placed across each opening at top and bottom, both inside and outside, and strongly bolted together. These serve also to support the ends of the diagonals and interior braces. Binding timbers were also placed each side of the openings, both inside and outside. Heavy tie rods in pairs at top and bottom of the openings served to tie the walls lengthwise, and similar rods were also run across the building. The general arrangement is shown in Fig. 1.

When this was all ready, the walls were pierced for "needles" at *about* 3 foot centers, according to the load to be borne. These were 14×14 inch hard pine, and were supported on two ranges of blocking, which were spaced at about 10 feet on centers. To prepare for this, excavations were made on each side of the foundation, so that at the start the cribs were 28 feet high, and at the close they were 43 feet high.

The cribs were built up of 6×8 inch timbers, and were each about 3 feet thick. At intervals of about 5 feet vertically, lines of timbers were carried across the space between to stiffen and bind the whole (see sketch). Several timbers were also carried through the blocking, across the building, and butted against the side walls of the adjacent building. There were also exterior shores



as seen in Fig. 1. An opening for the passage of carts was left through the cribbing at the front, and others at the side for carrying in material of various kinds. The "needles" rested directly upon longitudinals 14×14 inches, in lengths of 40 to 60 feet, against which the upper ends of the lifting screws took their bearing. The screws were 18 inches long and had a lift of 14 inches each; and as there were 300 in use, they were estimated to have a load of four to five tons each. Under the towers they were but 12 inches apart. They rested on 3 inch plank crossing the cribs, and were worked by six men, one on each side of each of the three walls turning each screw consecutively a definite amount. These were followed by a gang of men, who, as soon as the screws were out their full length, inserted new blocking. The job was eminently successful, and not the slightest accident occurred throughout. The cost also was very low, being about $3,500. The work of refitting was, of course, in addition to this.—*Sanitary Engineer.*

Gelatine Moulds for Reproductions of Carving.

Piece moulding, whether in clay, plaster or any other material, involves considerable skill and time; hence its unsuitability in reproducing large objects; and this renders it necessary to have recourse to a process not only more easy and quick, but to a great extent obviating the necessity of manipulating the casts when they issue from the mould. A process of moulding with gelatine was evolved, and it is applicable in the reproduction of big objects, by reason of the large area which a single mould can cover. As the gelatine is elastic, a great extent of what is technically called "undercut" in the carving may be embraced in one mould, thus rendering unnecessary the making of a number of joints.

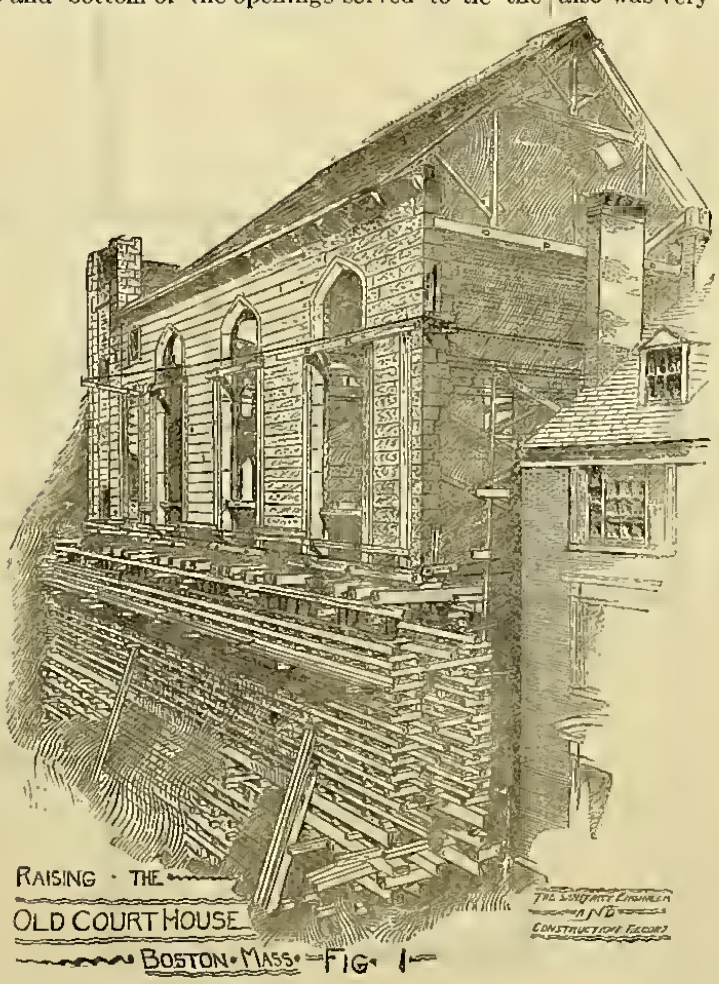
In withdrawing the elastic mould from the object under treatment, the gelatine stretches itself in order to become released from the undercut, but it regains its shape almost immediately, without destroying any of the extreme accuracy with which the gelatine is able to repeat every mark and grain on the surface produced. In every class of piece moulding, the method of covering the carved surface with a number of inelastic moulds, capable of being individually removed with ease, is theoretically the same; but the perfection of the plaster piece moulding depends on the skill of the moulder in so disposing the moulds as to have the fewest possible joints when the piece moulds have been made to completely cover the carving. These piece moulds are, in turn, covered, or rather backed, with larger moulds, which serve to hold them in position when the cast is being made. In the gelatine process the backing or wall to hold the mould is the primary work, and then hot liquid gelatine is poured between the backing and the carving.

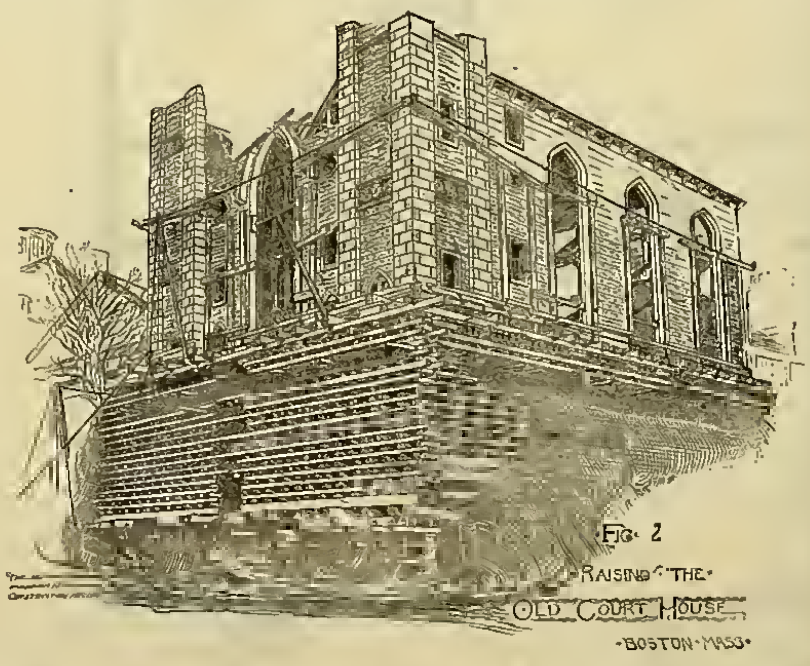
The process is briefly as follows: The carved surface is thoroughly cleaned and covered with rolls of modeling clay, the outer surface of the clay is smoothed, and a plaster coating or wall built against it. This wall is then removed, and the clay taken away; when replaced, an interval of the exact thickness of the clay will exist, and into this interval is poured gelatine. After twelve hours the gelatine will have attained the consistency of India rubber, and may be peeled off the carved surface. In cases of deep undercutting, considerable force is required to effect this. The gelatine mould is then laid on the wall which supported it in the liquid state, and a plaster cast or facsimile is made. In every distinct operation the greatest care and experience are required, in order that the natural good qualities of the gelatine may be allowed perfect freedom in producing an accurate copy.—*H. H. Cole.*

Paper Roofs.

A roof pronounced superior to that of slate, because of its lightness and other advantages, is now made of fibrous pulp. From this material tiles of any shape desired are formed by pressure under machinery, or by any other method which may suggest itself. Pressed into the designs wished for, the pulp tiles are partially dried, previous to being subjected to a water proof solution. Thoroughly impregnated with the preparation to resist moisture, they are baked to harden them in the water proof mixture. After the baking the tiles are surfaced. To this is added a coating of sand, whereby the pulp is rendered proof against the action of heat or flame. By the use of different colored sands, a variety of tints may be imparted to the tiles, which, after the application of the enameling mixture and sands, are baked for a second time, after which they are ready for use.

Besides the inherent lightness of the pulp tiles, which obviates the necessity of a heavy frame to support a weighty roof, the pulp tile, being tough and not brittle like slate, is far less liable to be broken by blows, stones thrown upon them, or human footsteps. Again, slate tiles cannot be laid compactly together on a roof on account of their brittleness, which prevents their being drawn tightly together by nails. Through the fibrous pulp nails may be driven as close home as in shingles, thereby binding them closely to the bed and together, without any possibility of lateral movement, or being blown away in high winds, as slates loosely nailed on roofs usually are. Nails penetrate the pulp tiles more easily than shingles, and line closer together, being more elastic than wood.—*Nat. Builder.*





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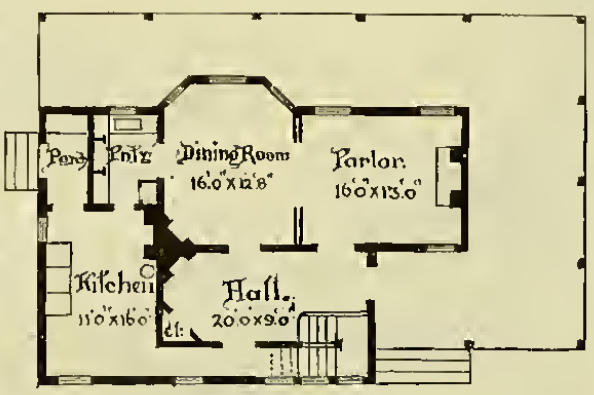
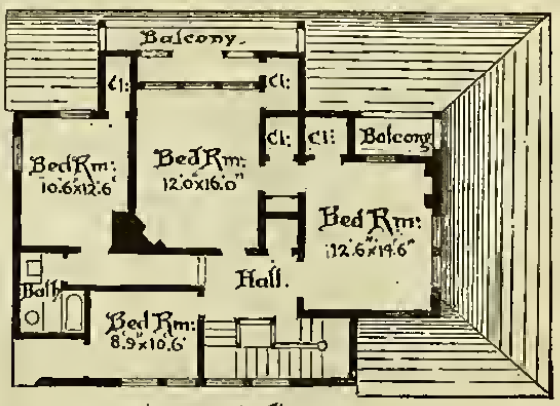
DESIGN FOR A SEASIDE COTTAGE.

We give herewith from our excellent cotemporary, *Building*, a very pretty design by E. L. Messenger, architect, for a cottage for the seaside. It will answer equally well for any other locality. The piazza space is ample, the interior arrangement good, and the design as a whole very pleasing.

Design for a Sea-side Cottage.



First Floor.



Second Floor.

Floors and Ceilings: Ancient and Modern.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

II.

THE ORIGINAL INHABITANTS.

It is by no means easy to determine the origin of the Japanese race, and latest researches have indicated that it is an amalgamation of several different races. The present Aino tribes of the island of Yesso are supposed to be the descendants of the ancient aborigines of the empire. They were scattered over a great portion of the country, but were gradually driven northward by the southwestern races. The conquering race were the ancestors of the present true Japanese people; but it is insisted by some archæologists that the Japanese are of Chinese origin. They assert that intercourse with the Chinese and Coreans has materially influenced the progress of Japan in the arts, and it is contended that the Chinese civilization is at least two thousand years older than that of Japan; but, if China has had such an early start, they have in the mean time fallen a long way behind the straight-haired race in the decorative arts, and whatever influences have been exerted upon them, they are able to preserve a distinctive character in all their works.

It will be seen from the relationship of the two races of people who inhabit the empire that we have two different types of homes to visit. There is not much difference in the two types, and it is quite probable that the one is the outgrowth of the other.

The earliest Aino buildings were floorless, but the needs of an advancing civilization led to the construction of floors to protect the tenants from dampness and rain. In Japanese buildings all the parts of a structure are held together by a system of "dovetailing," neither metal, nails, nor screws being used in their production, except for ornament. Miss Bird, who has left us the most interesting description of the Aino dwellings, having visited and lived in them for some time, says she is disposed to rank them, in some respects, above their conquerors. In their houses, as in their faces, the Ainos are more European than their conquerors, as they possess doorways, windows, central fireplaces, like those of the Scotland Highlanders, and varied sleeping places. The usual appearance, of which we shall give a plan and perspective drawing in a subsequent installment of this article, is that of a small house built on at the end of a larger one. The small house is the vestibule or ante-room, and is entered by a low doorway, screened by a heavy mat of reeds. It contains the large wooden mortar and pestle, with two ends, used for pounding millet, a wooden receptacle for millet, nets or hunting gear, and some bundles of reeds for repairing roof or walls. This room never contained a window. From it the large room is entered by a doorway, over which a heavy reed mat, bound with hide, invariably hangs. The room referred to was thirty-five feet long by twenty-five feet broad, and another was forty-five feet square. The smallest measures twenty feet by fifteen. These dimensions conflict with the statements of Dresser, Gonse, Audsley, Hildreth, and others, who uniformly agree that all rooms are some multiple of a yard, and that it is the size of the mats that establishes the floor dimensions of every room and the area of every house—that the houses are built to suit the matting, and the matting is never cut to suit the house. This unit mat, as we may call it, and which we shall more fully explain later on, is six feet by three feet. So that if one side of a room is divisible by six or three, the other adjacent side must be divisible by the same numbers.

On entering a room, one is much impressed by the great height and steepness of the roof, altogether out of proportion to the height of the walls, and of too bulky an appearance in comparison to the apparent strength of the supports. The frame of the house is of posts, 4 feet 10 inches high, placed 4 feet apart, and sloping slightly inward. The height of the walls is apparently regulated by that of the reeds, of which only one length is used, and which never exceeds 4 feet 10 inches. The posts are scooped at the top, and heavy poles resting on the scoops are laid along them, to form the top of the wall. The posts are again connected, twice by slighter poles, tied on horizontally. The wall is double, the outer part being formed of reeds tied very neatly to the framework, in small, regular bundles, the inner layer or wall being made of reeds singly attached. From the top of the pole, which is secured to the top of the posts, the framework of the roof rises to a height of twenty-two feet, made, like the rest, of poles tied to a heavy and roughly hewn ridge beam.

At one end, under the ridge beam, there is a large triangular aperture for the exit of smoke. Two stout, roughly hewn beams cross the width of the house, resting on the posts of the wall and on props let into the floor, and a number of poles are laid at the same height, by means of which a secondary roof, formed of mats, can at once be extemporized; but this is only used for guests. The poles answer the same purpose as shelves. Very great care is bestowed upon the outside of the roof, which is a marvel of neatness and prettiness, and has the appearance of a series of frills, being thatched in ridges. The ridge pole is very thickly covered, and the thatch, both there and at the corners, is elaborately laced with a pattern in strong peeled twigs. The poles, for the most part, run from wall to wall, compelling one to stoop to avoid skull fracture and the bringing down of spears, bows, arrows, traps, and other primitive property. The roof and rafters are black and shiny from wood smoke. Immediately under them, at one end and one side, are small, square windows, which are closed at night by wooden shutters, which, during the day time, hang by ropes. Nothing can insult an Aino more than to look into his window.

He is the last person in the world to exhibit an impertinent curiosity in the affairs of others, and he does not understand how it can possess other people. The experience, however, of a certain woman traveling in Japan, upon her first night in an Aino dwelling, rather tends to nullify our statement when the unknown is a foreigner; but we believe it will hold good as to its application to the Japanese in reference to each other.

On the left of the doorway is invariably a fixed wooden platform, eighteen inches high, and covered with a single mat, which is the sleeping place. The pillows are small, stiff holsters, covered with ornamental matting. A pole runs horizontally at a fitting distance above the outside edge of each, over which mats are thrown to conceal the sleepers from the rest of the room. The inside half of these mats is plain, but the outside, which is seen from the room, has a diamond pattern woven into it in dull reds and browns. The whole floor is covered with a very coarse reed mat, with interstices half an inch wide. The fireplace, which is six feet long, is oblong. Above it, on a very black and elaborate framework, hangs a black and shiny mat, whose superfluous soot forms the basis of the stain used in tattooing, and whose apparent purpose is to prevent the smoke ascending, and diffuse it equally throughout the room. From this framework hangs the great cooking pot.

Household gods form an essential part of the furnishing of every house. Ten white wands, with shavings depending from the upper end, stick in the wall. What a good decorative suggestion is here offered to those who ask, "What shall we do with our 'alpenstocks' when we return from the White or Adirondack Mountains?" Another projects from the window which faces the sunrise, and the great god, a white post two feet high, with spirals of shavings depending from the top, is always planted in the floor near the wall, on the left side, opposite the fire, between the platform bed of the householder and the low, broad shelf invariably on the same side, and which is a singular feature of all Aino houses, coast and mountain, down to the poorest, containing as it does Japanese curios, many of them valuable objects of antique art. No offers can tempt these poor people to sell any of their household antique possessions, and so gold lacquer, pearl inlaying, gold niello work, and daimios' crests in gold continue to gleam in the smoky darkness of their huts.

Except in the poorest houses, where the people can only afford to lay down a mat for each guest, they cover the coarse mat, which Mr. Morse says is similar to the Canton matting which we use in our own homes, with fine ones on each side of the fire

These mats and bark cloth are really their only manufacture, and this is one of the principal reasons we have for giving an account of it. They are made of fine reeds, with a pattern in dull reds or browns, and are fourteen feet long by three feet six inches wide. It takes a woman eight days to make one of them. In every house there are one or two movable platforms, six feet by four feet and fourteen inches high, which are placed at the head of the fireplace, and on which guests sit and sleep on a bear skin or a fine mat. In many houses there are broad seats a few inches high, on which the elder men sit cross-legged, as their custom is, not squatting Japanese fashion on the heels. A water tub always rests on a stand by the door, and the dried fish, bear, or venison for daily use hang from the rafters, as well as a few skins. Besides these things, there are a few absolute necessaries—lacquer or wood bowls for food and saki or sake or sachi, a chopping board and rude chopping knife, a cleft stick for burning strips of birch bark, a treble cleft stick for supporting the potsherd, in which, on rare occasions, they burn a wick with oil, the component parts of their rude loom, the bark of which they make their clothes, the reeds of which they make their mats. No iron enters into the construction of their houses, its place being supplied by a remarkably tenacious fiber. We shall now approach the modern dwelling, and also look into a Japanese shop or store.

(To be continued.)

PATENTS.

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Moulds for Romano-British Coinage.

It is very well known to numismatists that moulds of baked clay, made for the purpose of casting coins, have been found in various parts of this kingdom. These moulds consist of flat pieces of clay, having on each side an intaglio impression from a Roman coin; these are placed over one another, generally in three piles; through the raised rim of each mould a small notch is cut, which is turned toward the center of the three piles; the whole is then inclosed in a case of clay, contracted at the top, so that the external appearance resembles a common stone bottle. The melted metal is poured into the neck of the bottle, passes down the hollow space left in the center of the three circular piles of mould, and thence through the notches in the rim of each mould into the moulds themselves. The whole mass is then broken up, the metal is separated from the moulds, the edge of each piece is carefully cleaned and polished, and thus are false coins rapidly and cheaply constructed. It cannot be doubted that coins so formed are forgeries; but the question has been much discussed whether they are private or public forgeries. From an examination of very many of these moulds, many of them arranged within the bottles ready for use, some also still unseparated, with the metal remaining within them, it is evident that they were formed from coins of various types, and even various emperors; and from coins also in various states of preservation, some fresh and sharp, some partially worn by use. The forgeries, therefore, would not resemble a recent issue of coins of the emperor then reigning, but the general mass of coins, of past as well as present emperors, which were in ordinary circulation at the time in the locality where these pieces were made. Under such circumstances, the pieces would carry with them no indications of the place of their birth; pieces made at Lincoln might have been cast in moulds formed from coins struck in London, at Treves or Constantinople, or any other parts of the Roman empire. It is not necessary here to discuss the question by whom these pieces were made, especially as there are not any records to which we can refer for authority, and either side must be supported by arguments deriving the whole of their force from the ingenuity of the combatants, unsupported by evidence. It may only be stated in favor of the practice having been connived at, if not authorized, that these moulds are generally found in the sites of large stations, dispersed over a large surface of ground, and in considerable quantities, leading to the opinion that the operations were conducted more generally and openly than would be consistent with an illegal act which would subject a culprit to severe punishment.—*E. Hawkins.*

Built-up Doors.

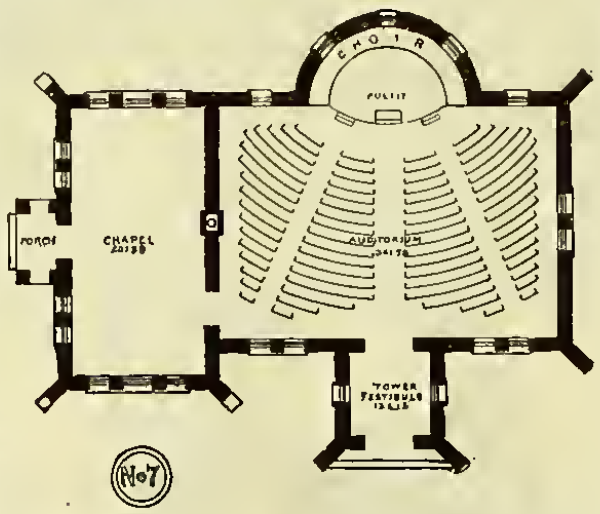
A feature of the building trade is the extensive use that is made of veneers. The method of building up doors of strips of pine has tended directly to this result. The built-up door made of strips of pine glued together is stronger than any other kind, at least of equal weight, and will not warp. But it necessitates the use of veneers of some kind. For heavy doors, quarter inch stuff is used; but for smaller doors in residences, one eighth inch is often considered thick enough. The kind of wood depends on the finish of the room. Mahogany, cherry, oak, and curly or bird's eye maple are perhaps the most common. This method of construction is particularly valuable where the opposite sides of doors have to be finished differently, to correspond with the rooms which they respectively face. This has often been done by making the door of two layers, generally of equal thickness, the unequal shrinking and swelling of which would twist the door, and often tear it to pieces. The objection is raised against veneering that it is dishonest, and so not true art. That criticism should never be made in regard to such work as that mentioned. The built-up door of pine, veneered with mahogany, costs about as much as one of solid mahogany, and is a better one.

DESIGN FOR A $5,000 CHURCH.

This design is modeled after some of the old English country churches. C. A. Dunham, architect. Its location should be upon a slight rise of ground, about as represented in the plate, with an abundance of space around it. When all is completed, let the ivy be planted and cared for, and in a few years it will present a picturesque appearance.

It is intended to be built of rough stone, dressed only around the doors and windows.

The capacity is 250 sittings.



Building to be warmed by steam and properly ventilated.

The windows fitted with stained glass.

Open timber roof and ceiling, walls decorated in an appropriate manner.

The cost of this structure need not exceed $5,000.

Staining Wood.

The following are recipes for staining wood, which are said to be used in a large establishment on the Continent with great success:

Light Walnut.—Dissolve 3 oz. permanganate of potash in six pints of water, and paint the wood twice with the solution. After the solution has been left on the wood for from five to ten minutes, the wood is rinsed, dried, oiled, and finally polished.

Light Mahogany.—1 oz. finely cut alkanet root, 2 oz. powdered aloe, and 2 oz. powdered dragon's blood are digested with 26 oz. of strong spirits of wine in a corked bottle, and left in a moderately warm place for four days. The solution is then filtered off, and the clear filtrate is ready for use. The wood which is to be stained is first passed through nitric acid, then dried, painted over with the alcoholic extract, dried, oiled, and polished.

Dark Walnut.—3 oz. permanganate of potash are dissolved in six pints of water, and the wood is painted twice with this solution. After five minutes, the wood is washed, and grained with acetate of iron (the ordinary iron liquor of the dyer) at 20° Tw. Dry, oil, and polish as usual.

Gray.—1 oz. nitrate of silver is dissolved in 45 oz. water, and the wood painted twice with the solution; afterward, the wood is submitted to the action of hydrochloric acid, and finally washed with ammonia. It is then dried in a dark place, oiled, and polished. This is said to give remarkably good results on beech, pitch pine, and poplar.

Black.—7 oz. logwood are boiled with three pints of water, filtered, and the filtrate mixed with a solution containing 1 oz. of sulphate of copper (blue copperas). The mixture is left to clear, and the clear liquor decanted while still hot. The wood is placed in this liquor for twenty-four hours; it is then exposed to the air for twenty-four hours, and afterward passed through a hot bath of nitrate of iron of 6° Tw. If the black, after this treatment, should not be sufficiently developed, the wood has to be passed again through the first logwood bath.

A DWELLING OF MODERATE COST.

This attractive little house was lately erected for Mr. Edwin A. Burgess, at Buttonwood, R. I., from the designs of Mr. C. F. Wilcox, architect, of Providence, R. I.

The foundations and chimneys are built of brick on a stone foundation, the cellar being six feet deep. The frame of the house is of spruce, boarded with hemlock, trimmings and clapboards of first quality pine, and the soffits and other parts not exposed to the weather are of second quality. Shingles are of cedar, shaved on the roof and sawed on sides. Piazza and balcony floors 1⅛ inch matched hard pine, and the ceiling over same matched and headed pine. Gutters, valleys, and piazza roof are tinned with first quality M. F. tin, while the conductors are three inches in diameter, of corrugated galvanized iron.

The sashes and doors are 1⅜ inches thick, and the outside doors 1¾ inches. The floors are of spruce throughout, excepting in the kitchen, servants' bedroom, and closets, which are of hard pine. Staircase is formed with returned nosings, and is provided with 1¼ inch balusters, four inch posts, and three inch ash rail. The trim is of ordinary stock patterns throughout.

The painting includes three coats for all outside work, including the shingles, three coats of metallic paint on tin roofs and gutters, and all inside pine work two good coats of paint, the knots, shakes, and defects being properly shellacked. The hard wood is finished with three coats of shellac and rubbed down.

The residence forms, on the whole, a very compact and convenient one, and costs to build about $3,000.

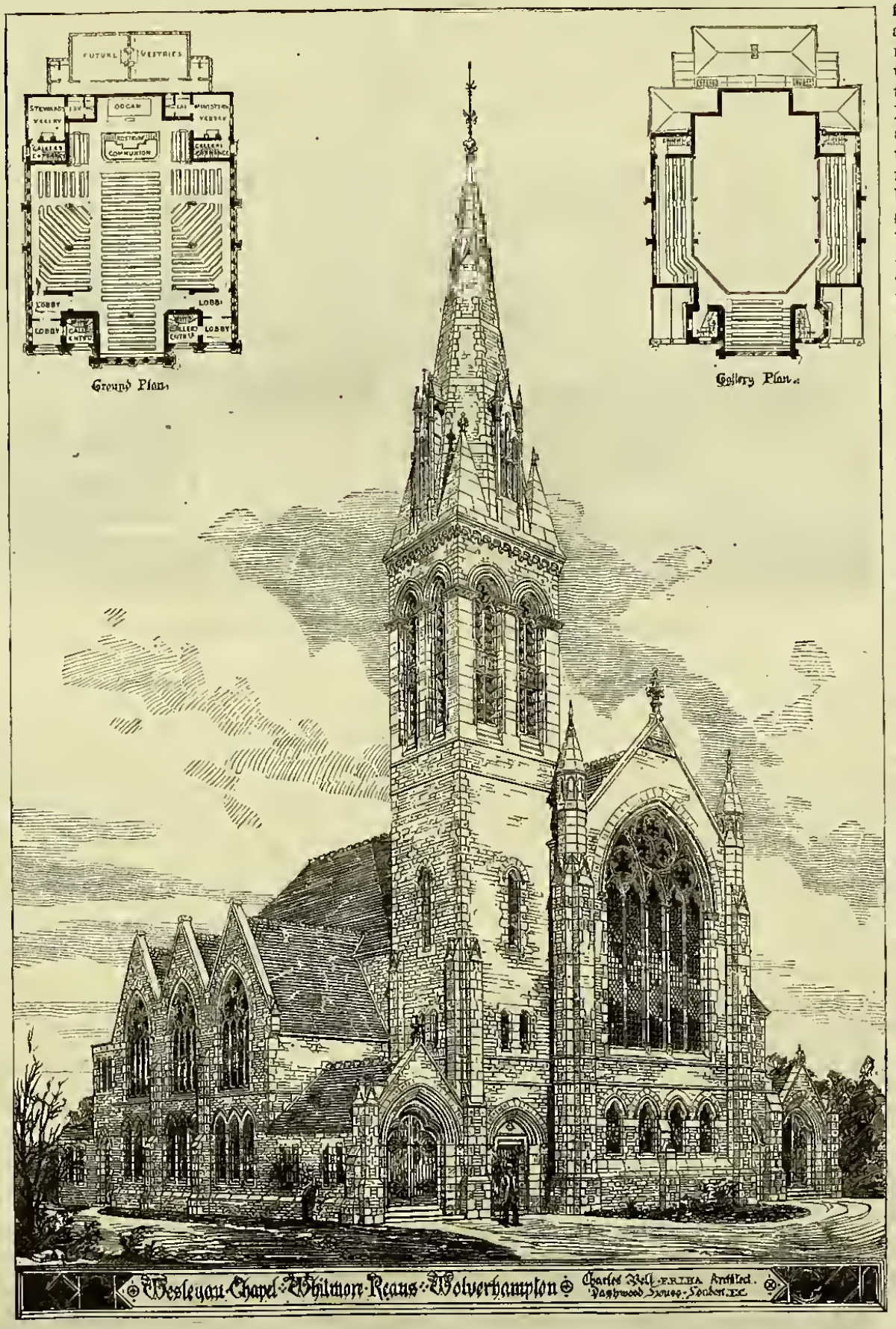
Heating by the Combination of Warm Air and Steam.

In our description of this excellent system of heating given on page 92 of our last issue, the name of the manufacturers and inventors was given incorrectly. It should have been Messrs. Weir & Nixon, 1410 and 1412 North Sixth Street, Philadelphia, Pa., who inform us that they will be glad to give any of our readers interested in the subject whatever further explanation may be required.

A COUNTRY CHURCH.—C. A. DUNHAM, ARCHITECT, BURLINGTON, IOWA.

WESLEYAN CHAPEL, WHITMORE REANS, WOLVERHAMPTON.

The design for the above, which we illustrate, was selected in competition, and was prepared by Mr. Charles Bell, F.R.I.B.A., of Dashwood House, New Broad Street, London. A somewhat novel treatment of plan was adopted, viz., that of a nave and triple transepts, the effect of which, both internally and externally, is very satisfactory. The chapel is planned to seat 530 on the ground floor and 230 in the galleries —total, 760. The walls are built in parpoints, with Codsal stone dressings. The columns supporting the nave arcade are of red and gray granite. The sittings are of selected pine. The roof is open timbered, with hammer beam principals. The windows are filled with quarry glazing executed by Mr. Brewster, of Maitland Park, London, the front window being of special design. The builder was Mr. Thomas Moss, of Stafford, and Mr. Davis, of Walsall, acted as clerk of works. The total cost of the building has been about £3,500, or $17,500.—*The Architect.*


Ground Plan.
Gallery Plan.
Wesleyan Chapel, Whitmore Reans, Wolverhampton.
Charles Bell, F.R.I.B.A. Architect. Dashwood House, London, E.C.

Shelter Belts and Hedge Screens.

What to plant is a question that some may desire to have answered. The very wealth of material before us greatly enhances the difficulty of making a response. We have deciduous trees that are bare in winter, when shelter is most needed, and we have also evergreens in great variety, that retain their refreshing verdure all through the year, and provide the most perfect shelter. For the wind breaks of the field, and even for groves about buildings, the leafless trees have much value, and their judicious disposition will greatly check the cutting storms. The wind, after sifting through the branches, is reft of half its power for evil. Nor is its force restored for some distance. The majority of wind breaks are composed of deciduous trees, and usually of the commonest species—anything that will rapidly grow into a tree, or that can be most cheaply procured. This practice need not, however, prevent us from using any of the more valuable hard wood and other trees in making shelters, but, in some instances, our impatience may prevail over our judgment as to the more valuable species, and induce us to plant only those of rapid growth to insure a speedy result. As to the use of evergreens in outside shelter belts, though more expensive at first, a smaller number and a narrower surface devoted to the wind break will prove so much more effective than a wider strip of deciduous trees as to justify the increased outlay. Sometimes even a single row of Norway spruce, or of hardy pines, like the Scotch or the Norway spruce, or even of the common red cedar or arbor vitæ, will make an admirable wind break. Plant any of the many trees at your command, and plant them where they will produce the desired protection. Whether you select the so-called cheap trees, such as white willows, poplars, soft maples, etc., or whether you choose oaks, hard maples, the white ash, the elm, the wild cherry, the tulip, the walnut, and hickories, or hardy evergreens, do not neglect the planting of these invaluable aids to good culture. When we come to a selection of the plants best suited to the protection of our homes and their surroundings, we again find abundant material from which to make choice. For trees and for tall screens the favorite with many will be the Norway spruce, which grows rapidly, is easily transplanted and managed, and which presents a welcome tint of green that is always persistent and full. The other spruces are also desirable, particularly the white and the black. They all bear the knife and shears very well, and may easily be kept within due bounds when used as hedges for shelter. The native hemlock is particularly commended standing alone, but it is also one of the very best species for forming a screen or shelter hedge, as it may be clipped to a perfect plane, and, when necessary, it can be confined within narrow limits. In the case of trees to be planted about buildings, we should consider their beauty, and, with this character in view, we should select, among evergreens, the hemlock, the white pine, perhaps also the red pine, or Norway, but not the Scotch fir, nor the Austrian. There we may also place the American arbor vitæ, but the especial function of this species is the formation of shelter screens and hedges, for which it is particularly well adapted, except in very dry soils. Nothing can be prettier than a well trimmed hedge of arbor vitæ, unless it be one of hemlock, as the latter preserves its deep green hue unimpaired all winter. Some of the dwarf pines may also find a place in front or at the sides of the house, but they never attain sufficient size to make much shelter, The same is true of the beautiful retinosporas from Japan, which answer well for low screens, and are highly ornamental. The common red cedar is, after all, a most useful plant. It has been called the poor man's evergreen, on account of the facility with which it may be produced in all parts of the country, as well as the certainty and rapidity of its growth. Though not of so fine a color as some others, this tree makes dense foliage when set as a shelter belt and wind break. It also makes a close hedge to screen pathways.

The ground for the wind breaks should be well prepared. A strip of one rod in width will be needed if it is proposed to plant but a single row, and several rods wide must be prepared if it be designed to plant a good wind break of many rows, which is the better plan. After harrowing the ground a furrow is struck for every row of trees, and these furrows may be four feet apart, for then the plants may be set every four feet. This requires very little labor, unless large trees are selected, and if these be large evergreens they need not be so close, but more care will be required in planting. Yearlings and two year old plants of most deciduous kinds, or stout cuttings of willows and poplars, will be the cheapest and best. The young trees, when planted with reasonable care and well fixed in the soil by pressure of the foot, will be sure to grow, but so will weeds, and the plantation must be cultivated for about two seasons, so as to keep down all intruders. With this treatment their growth is greatly enhanced, and they will the sooner shade the ground, when they will suppress the weeds and take care of themselves. They must, however, be protected from the inroads of stock of all kinds. This is an absolute necessity. When to plant, though an important question, need not detain us long. Plant when you get ready, autumn or spring, but be sure to have the soil ready for the reception of your trees before bringing them on to the ground. Let it be dry enough to crumble. Never plant when it is wet and clammy. Deciduous trees may be set out in autumn, when we have leisure to do the work, and when the soil is dry and warm.—*Rural New-Yorker.*

Building Construction in Winter.

The prosecution of masonry work during frost would appear to be plainly undesirable, even if it were practicable to make mortar and cement with freezing water. In Berlin, where a paternal government thinks for everybody, a police ordinance was some time ago issued to forbid bricklaying when the temperature falls to 26° Fahr. This order being based on the assumption that at the temperature named mortar freezes but does not set, Herr Krause, an architect of Stropp, sent a communication to the *Baugewerke Zeitung* to show, from his experience, that the order in question was unnecessary.

Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very sharp frost; the temperature being down from 14° to 23° Fahr. The bricks and sand were frozen, and the workmen had great difficulty in setting the bricks, the mortar freezing under their hands. It would have been much too expensive an operation to warm all the materials previously; and so the lime was slaked in small quantities at a time, and mixed hot—the brickwork being liberally pointed. He naturally expected to find the work perishing in the spring; but he was mistaken—the mortar continuing as firm as if it had stood for several years. The same building was pulled down in 1880, when the mortar was found to be so good that the bricks broke, and could only be cleaned with great difficulty.

Herr Krause subsequently had outer pointing done at several degrees of frost; and always found that if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. If frost attacks freshly used mortar, and continues for some time, the mortar is benefited rather than otherwise; but it is different if the frost gives way to a thaw in a few days. Herr A. Klemm, of Stuttgart, entertains the same opinion; citing in proof the brickwork of the Prussian House of Deputies, built in the winter of 1848-49 during a most severe frost. Hydraulic lime, freshly slaked, was used; and in 1867, when some alterations were required, wedges and hammers had to be used to break up the work. Throughout Wurtemburg it is the general opinion that sharp and long-continued frost improves brickwork and plastering, and other German authorities testify in the same strain.

ST. AUGUSTINE, FLORIDA.

This ancient city, the oldest in the United States, founded by one of the bravest and most celebrated of the Spanish knights, was visited, on the 12th of April last, by a conflagration which resulted in financial losses estimated at a quarter of a million dollars and the destruction of the time honored cathedral, a loss which is irreparable. The fire broke out in the St. Augustine Hotel, which was soon in flames, as were the Edwards House, the Cottage, the Planters' House, the Florida House Annex, the First National Bank, the old Spanish cathedral.

The roof caught and soon fell, destroying all the old historic relics in the interior. The old chimes fell, too, their last work being the alarm which summoned the citizens to the scene of conflagration. By great effort the bishop's house was saved. In addition to the foregoing, the flames reached the Sinclair Block, in which were the stores of Gonzalez & Benhayon, Moy Yong's restaurant, Vedder's museum, Buck's restaurant, Davis' barber shop, Goldering & Co.'s cigar factory, and Speizegger's drug store. All were completely destroyed. Next Chamberlain's grocery and Mrs. B. E. Carr's dwelling, north of the Sinclair Block, were destroyed. Returning to the west side of the street, the flames reached the old County Court House on the north, which was totally destroyed. The records, however, were removed and saved. Vedder & Compton's store and Welter's restaurant on the west burned also. Here the fire was checked.

The old cathedral, one of the most interesting landmarks in the city, was built in 1793, and was in use for purposes of worship up to the time of its destruction.

It historical and antiquarian interest, as the oldest city in the United States, the quaintness of its structures and its atmosphere of mediæval repose have done perhaps as much as its mild climate and beautiful situation to make St. Augustine a favorite winter residence. Ponce de Leon, in his search for the "fountain of youth," made a landing there as early as 1512, at the point where the city was afterward established, but it was not until 1565 that a permanent settlement was made there by the Spanish. The cathedral had in its tower a bell bearing the date 1682. The custom house was formerly the residence of the Spanish governor. The remains of a lighthouse with fortified walls, one of the early buildings of the Spaniards, still exist on Anastasia Island, and traces remain of the two lines of defenses, a ditch and an embankment which stretched across the peninsula. During the two centuries of Spanish occupation the maximum population of St. Augustine was 3,000, besides a garrison of 2,500, and its population is about 3,000. Fort Marion, in which part of the Apache prisoners have been confined during the winter, was completed by the Spanish, having been more than 100 years building. Within the last two or three years St. Augustine has been growing rapidly in popularity as a winter resort, and a great sum of money has been expended upon hotels and other structures for the entertainment of visitors. The Villa Zorayda, constructed for a private residence, out of shell concrete, proved so satisfactory and so harmonious with its antique surroundings that H. M. Flagler, of this city, began last year the construction from the same material of the great hotel Ponce de Leon, the first of a group of notable buildings which was to include the "Alcazar," the "Casa Monica" and other structures of an Oriental type.

Some idea of the size and peculiar architecture of this remarkable building may be gathered by a glance at our engravings, for which and for the subjoined particulars we are indebted to our excellent cotemporary, *The South*:

"Who ever heard of driving *into* a hotel in America, or finding orange groves or flower gardens on its roof, reminding one of the famous hanging gardens of Babylon?

"It would seem there was nothing too costly or elaborate to connect with this remarkable building. The bewildered visitor, after being driven under an imposing archway and across a court wherein are fountains and rare tropical plants, trees and flowers, will alight under a regal canopy, and walking a few steps over a floor composed of variegated marble, will find himself in a rotunda under a dome whose apex is eighty feet above him, with galleries one over the other looking down upon him. Picturesque towers rise 135 feet on either side, affording remarkably fine views, marble staircases lead to the balconies or loggias overlooking the court, where lovers may find many a sequestered nook, or, instead of seeking the gloomy grandeur of one great parlor, may stroll into any one of many elegant rooms off the grand hall and enjoy a tete-a-tete unembarrassed by observation.

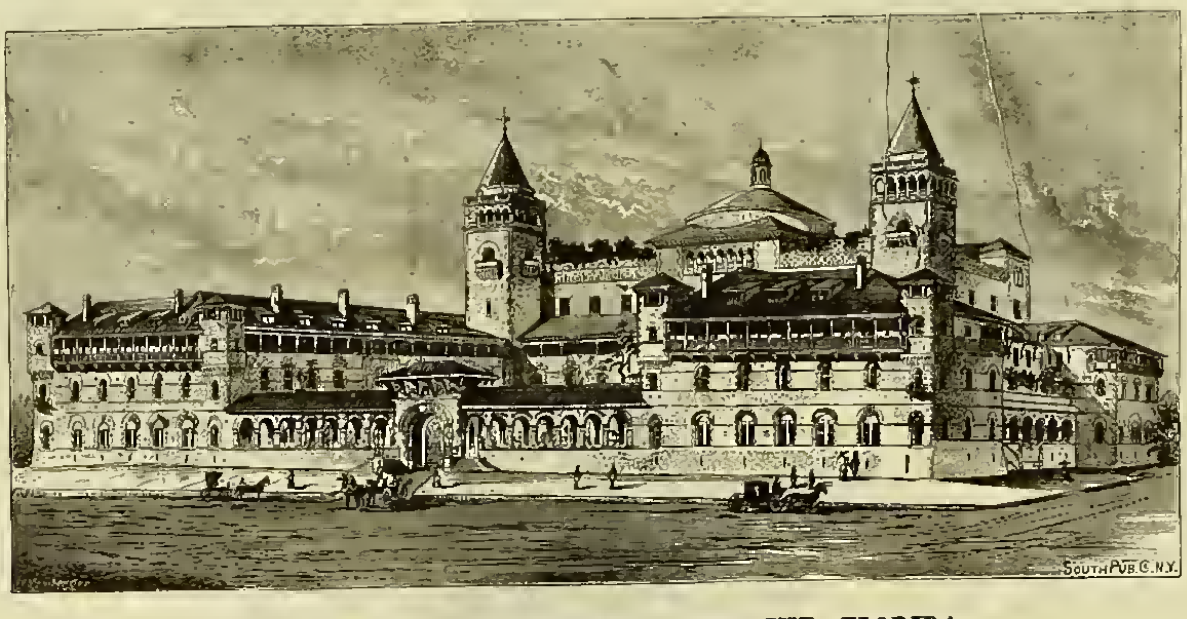
"The dining room reminds one of the great banquet halls of Belshazzar, though many times as large, as it will seat over 700 people at once, and vaults thirty-five feet to the ceiling, having circular ends, opening upon wide overhanging balconies.

"The entire structure covers nearly five acres, and contains 450 rooms, most of which have fireplaces. But statistics are tedious, and we only aim to chronicle what is unique regarding the Ponce de Leon. It is safe to say that there is enough of this to provide entertainment for the guest for days and weeks, and when these have passed he will still find new attractions, marbles, mosaics, carvings, terra cotta groupings and balconies before undiscovered, to please his æsthetic soul. Ennui is the bane of the tourist, and the owner has set himself to the task of entertainment by building an Alcazar, or pleasure resort, also of coquina, 250×450 feet, adjoining the hotel, which will include sulphur, salt swimming baths, billiard rooms and bowling alleys, forty shops or bazars for curiosities, and cafe arranged around an open court, and in the grounds adjoining will be lawn tennis and croquet courts. Tourists may in the Alcazar secure first class rooms at less rates than at the hotel proper, while rooms at the Ponce de Leon may be obtained at the same rates as those charged at any grand resort hotel.

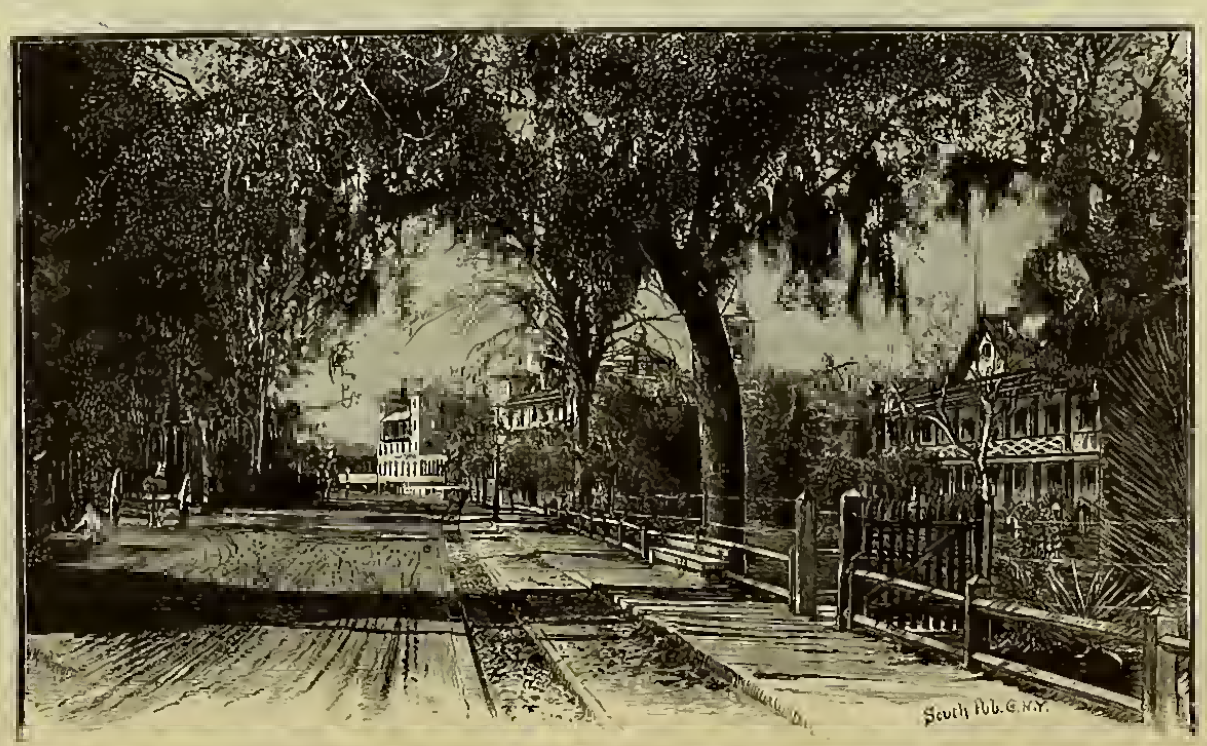
"As out door exercise is indispensable, the guests will have the range of twenty-five acres of beautifully kept grounds, including the romantic "Lovers' Lane," an archway of orange trees, formerly belonging to the Ball estate, destined to be the scene of many tender passages.

"Villa Zorayda, a private, elaborate Moorish residence, is opposite the towering hotel walls. Ten thousand car loads of earth have already been used for beautifying and extending the grounds connected with the hotel.

"As everything connected with this hostelry is on such a grand scale, it will not be surprising to learn of its unique water supply. The largest artesian well in existence is daily growing deeper, not for more water, for a flow of 8,500,000 gallons per day is already running to waste, or an amount equal to one-tenth of the capacity of the Croton aqueduct, but soft water is demanded. Now the supply is sulphureous, and while no doubt beneficial as a bath for those afflicted with skin diseases, is too odorous for healthy guests, ablutious or drinking purposes. But what if water *hot* enough to heat the hotel should be secured? The temperature of that flowing is now at 80°, with a steady increase as the bore progresses, so while the supply of pipe and money holds out, it may be that this most remarkable of all projects will result in success."



PONCE DE LEON HOTEL, ST. AUGUSTINE, FLORIDA.



PONCE DE LEON HOTEL FROM PLAZA, ST. AUGUSTINE, FLORIDA.

How to Finish in Natural Wood.

To finish the interior woodwork in the natural wood, says the *Hub*, first apply any of the modern wood fillers at present in the market, after which sandpaper very smooth, dust off thoroughly, and apply a coat of varnish, which should be allowed to stand until dry; then lightly rub down with ground pumice stone and water, clean off well, and apply a second coat of varnish, which should be treated in the same manner, and a third coat given. When thoroughly dry, rub down with powdered pumice stone and linseed oil. Hair cloth is preferred for the rubbing material. The work when cleaned off will present a dull satin finish, and be thoroughly filled up.

Many prefer hard oil finish to varnish, which has this advantage over the latter, that it is not so liable to scratch or chip, being more elastic in its nature. Whichever is lightest in color should be used, as its effect on the wood will be less liable to change its natural color. The lighter the varnish the less change there will be, the darker, the more change, hence light shade varnishes are always selected for this work.

THE *Sanitary News* recently made a suggestion in regard to keeping the plan of the plumbing in a building in a conspicuous place, so that when the same requires any repairs or alterations, reference can be made to the plan and the same consulted, and thus to a great extent much useless and expensive experimental work avoided. The suggestion is to engrave the plan on a slate slab and build same in the wall of the kitchen, thus making it permanent. Another journal suggests that the plan be painted on the inner side of a door to a closet. Either plan will suffice for the purpose, and the suggestion is one that deserves attention in the building of all classes of houses.

Although copies of the general plans are frequently preserved by owners, it is very seldom that they are turned over to the purchaser of a house when it is sold. To adopt the idea suggested above would incur very little expense, and will undoubtedly be favorably indorsed by all architects, when the fact is taken into consideration that this particular part of the work will probably require attention in after years, when the architect is no longer in charge of the work, and, therefore, would most likely not be consulted. Then his plan is there, and his original ideas can be seen.

PLANING MILL CONSTRUCTION.

The first thing to be considered is the selection of the site. This matter should be weighed carefully, as the success or failure of the enterprise depends to a great extent on the facility with which material can be placed in the mill and the product discharged from it. Having settled this point, we begin our foundations, which should be heavy and well built, either of stone or brick, for, in addition to the weight of our machines, we are likely to have several car loads of lumber on the floor, which, in the course of working, are piled first on one side, then the other. The load is thus continually changing, causing the floor to sag unless well supported, thus making our machines stand like a chicken

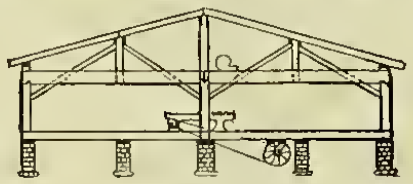


Fig. 1.

in the snow, first on one leg, then the other. It is impossible to do first class work, no matter how good the machine, unless it is well set on a solid foundation. We next come to consider the building. The engine room and shavings vault should be of brick, as a safeguard against fire and frost. The mill proper roomy, and with the least possible number of posts, to facilitate the handling of the lumber from one machine to its neighbor. Sixty feet is a very good width, the length to be governed by the number of machines it is intended to accommodate.

We present here a plan that has been tested with success under the heavy loads of snow of the North, as well as the more genial clime of the South. Fig. 1 is a cross section, showing manner of framing. Side posts are 6 × 8 in.; center post, 8 × 8 in.; purlin posts, 6 × 6 in.; beams, 2 × 12 in. One post on each side is dovetailed in and spiked to braces from main posts to purlins, 4 × 4 in. These pass up between the beams and are well spiked to them. The purlin plates are 2 × 12 in., spiked to sides of posts, their lower edge

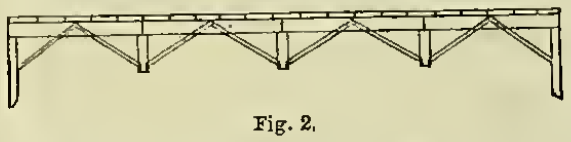


Fig. 2.

resting on the main braces The purlin braces are 2 × 6 in., running up between the purlin plates, to which they are spiked, as shown in Fig. 2.

Fig. 3 shows a plan for raising the center portion of roof when it is desirable to get more light, as in sash, door, and blind factories. The ridge is supported by 2 × 12 pieces, spiked to sides of center posts, and braced in the same manner as purlins shown in Fig. 2. Thus it will be seen it is possible to get a room at minimum cost, 60 × 90 ft. if desired, with only three posts inside, and these located in the center, entirely out of the way.

In these plans it will be seen we locate the line shaft under the floor, which, for several reasons, is preferable to the usual way of placing it overhead. We are able to place the bearings as often as necessary, and near the driving pulleys, where they are most needed. Our driving belts are under the floor, out of the way. There is no danger of men getting hurt by getting caught in them. Machines stand steadier, and belts

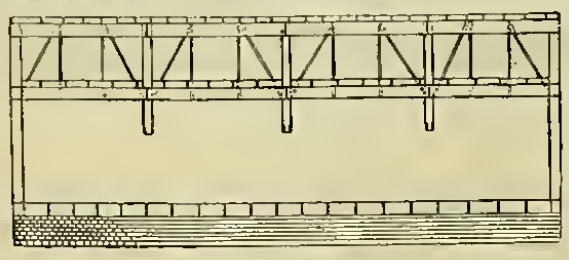


Fig. 3.

grip the pulleys better, as they run nearly horizontal. Thus we are able to run them with less tension, making them last longer, also reducing the tendency of loose pulleys running hot—a source of much annoyance and loss of time.—*The Timberman.*

Bursting of Lead Pipes.

A paper was recently read before the Glasgow Philosophical Society by Mr. George C. Thomson, F.C.S., on "The Bursting of Leaden Water Service Pipes by Water Pressure and Frost." The general impression, he said, was that a pipe burst after a thaw set in, being caused by the ice in the pipe melting, and the pressure thus becoming too great for the strength of the metal. Mr. Thomson gave a number of facts to refute this idea. He said that water in changing into its solid form of ice increased in bulk by 10 per cent, and this led to a pipe bursting. He asked the question at what pressure did a pipe burst, and in answering it said that the rules of the Glasgow Corporation Water Works specified only the weight of the pipes, and, unless otherwise agreed upon, they stated nothing as to the strength or quality. In order to have some idea of the strength of pipes, he had tested various sizes, from ½ inch up to 1½ inches, and found the bursting pressure of the former was 1,820 lb. and of the latter 812 lb. One would naturally suppose that the strength of the various sizes of pipes would be on an equality, or nearly so; but this was not the case, as the ½ inch pipe only burst at more than double the pressure the 1½ inch pipe did.

TIN ROOFING.

We have pleasure in referring to the well known and enterprising firm of N. & G. Taylor Co., who are so widely recognized for their integrity and the quality of

GRAND UNION DEPOT, INDIANAPOLIS.

their goods. This house, which is one of the oldest in the United States, having been established in 1810, has lately obtained a most important and extensive contract for covering the fine depot now in process of construction at Indianapolis, for the Union Railroad. This building, of which we show a view, is thus referred to by the Philadelphia *Press:*

The contract for supplying the tin for roofing the Grand Union Station, at Indianapolis, has just been awarded to Messrs. N. & G. Taylor Co., the well known tin plate and metal importers, of Philadelphia, Pa. It is of so large a magnitude that it forms the topic of general conversation among the trade. Fifteen prominent railroads will center in the immense structure, the total cost of which will exceed $1,000,000. The depot proper and baggage rooms will be 150 feet square and the train sheds, adjoining the depot, some 750 feet long by 190 feet wide. The building will be composed principally of glass, iron, and dressed stone of artistic shape and design.

The plans were designed under the supervision of Mr. Thomas Rodd, engineer and architect for the Indianapolis Union Railroad Company, at Pittsburg. The tin work on the buildings will be done by Mr. Thomas W. Irwin, of Allegheny, Pa., and Messrs. Carpenter, Annear & Co., of Louisville, Ky.

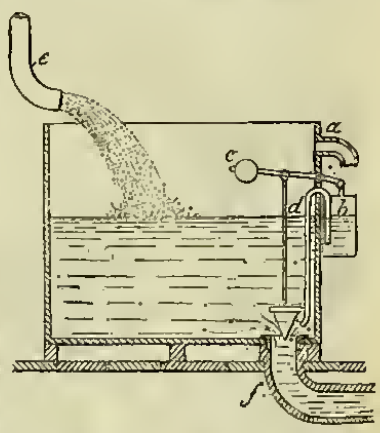
The award to Messrs. N. & G. Taylor Co. is for their "Old Style" brand of roofing. It is claimed to be the best roofing tin in the market to-day. Every sheet is made by the old manner of hand dipping, as first made in Philadelphia in 1830, and sold by this firm. It is thus called the "Old Style" double coated and redipped. It is said to outlast any other roofing made.

To fulfill the present contract it will take some 500 boxes of the 28 by 20 inch size ternes, there being in all some 150,000 square feet of surface. This is the largest contract ever awarded for so fine a grade of roofing plates, and it is a significant fact that in this age of deceptions, cheap qualities, and imitations, especially in roofing tin, so decided a preference should be expressed from so high a source in favor of this firm's brand over all competitors.

This same brand of roofing was selected by the Board of Guardians of the Poor to cover the Blockley Almshouse, in West Philadelphia, some months ago. Some 200 boxes were used there. Wherever the tin has been brought to the notice of practical men, unbiased by any political favoritism or otherwise, it has met with favor, and many instances could be mentioned in every prominent city and town in the country where this fine brand has been chosen over all others, on account of its superior quality.

RESERVOIR WITH AUTOMATIC VALVE.

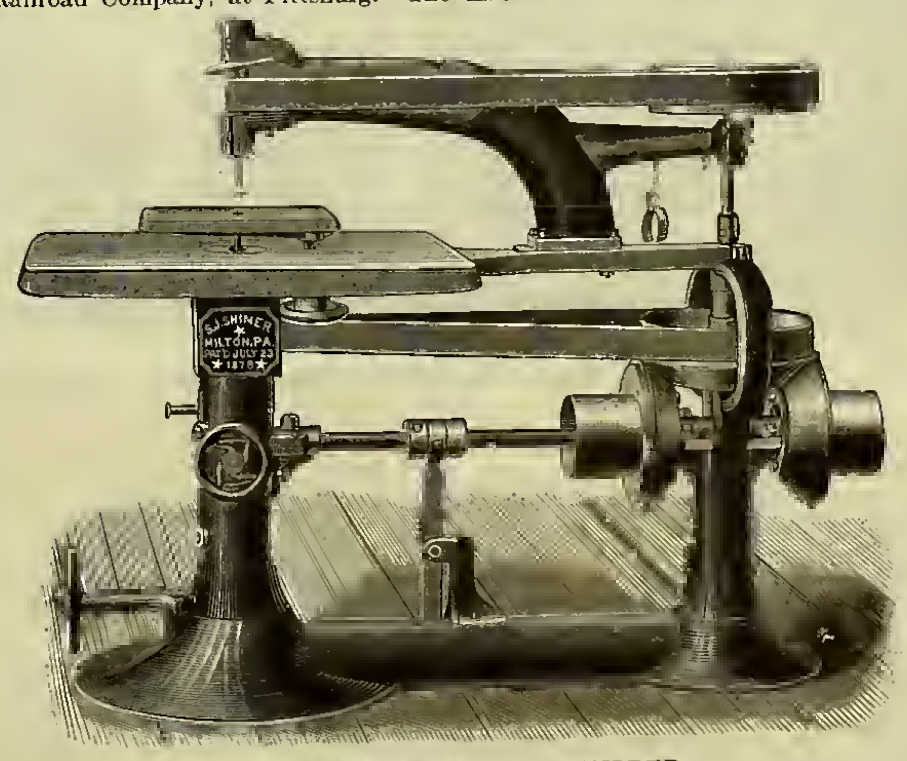
The figure represents a new system of water reservoir with an automatic valve. The water enters the reservoir through the pipe, *e*, and, when it reaches the level of the spout, *a*, flows through the latter into the vessel, *b*. When the weight of this vessel counterbalances that of the counterpoise, *c*, of the lever and its valve, the latter rises and allows the water to flow out through the pipe, *f*. As the liquid flows into this pipe, it creates a suction that sets in operation the siphon, *d*, which empties the vessel, *b*. This latter then drops and causes the lever to place the valve on its seat again.—*Revue Industrielle.*



IMPROVED VARIETY MOULDER.

Among the most useful tools for the planing mill, the woodworker, and the furniture factory are the patent variety moulders of Samuel J. Shimer, of Milton, Pa. These are made in several different sizes, styles, and weights, of which we show the one designated as "No. 6." This is a useful, compact, and very serviceable machine, fitted with all the latest improvements, the chief of which is that it may be used for both countersinking and edge moulding. The former is effected with a pattern guided by a pin, which automatically takes its position when the machine is started, and drops out of the way when it is stopped.

When it is desired, the machine may be quickly changed from a surface moulder to a variety moulder, by adjustment of the parts and by raising the arm. There is no necessity, in making the change, either to unbolt or lay away any part, which is a considerable improvement of itself on the old fashioned style of machines.



IMPROVED VARIETY MOULDER.

But the completeness and simplicity of the tool, and the accuracy and rapidity of its work, are its chief qualities, and render it one of the finest machines of its kind on the market.

WE should be pleased to have our readers bear in mind the fact that full plans and specifications for any of the buildings illustrated in this paper may be obtained at this office on moderate terms. We are assisted by able architects, and can execute any work desired on very moderate terms. Munn & Co., 361 Broadway, New York.

Costs of Different Kinds of Walls.

The following, from the *National Builder*, shows the comparative cost of frame, brick, and stone walls.

The first idea that naturally suggests itself, after the general plan of arrangement has been perfected, is what material shall mainly enter into the construction of a building—brick, stone, or wood. In nearly every portion of the Eastern, Middle, and Western States, these three building materials can readily be had, and the cost of production does not vary much in any locality. Assuming, therefore, that the first cost is the same in the above localities, we may easily arrive at the ultimate cost of construction. For the purposes of this article, we may assume the cost of good common brick, during the summer, to be $8 per thousand; cost of labor and mortar to lay the same in wall, $4 per thousand, wall measure. The cost of good quarry stone, assumed at $10 per cord; the cost of labor and mortar to lay the same in wall, $8 per cord of one hundred feet. The cost of framing lumber, $12 per thousand feet; labor and nails to put same up, $6 per thousand. With these prices as a basis, it is a matter of computation only to arrive at the proportionate cost of each material after it has been worked into the walls. As an example, suppose we have ten feet square of plain wall to build, what will be the comparative cost? Ten feet square equals one hundred superficial feet. If to be built of brick twelve inches thick, estimating 22½ brick to the superficial foot, would take 2,250 brick; cost in wall per thousand, $12, equals $27.

To lay a good rubble stone wall, it should be 18 inches thick, therefore 10 feet square, or 100 superficial feet, of stone wall 18 inches thick, at $18 per cord of 100 feet, would cost $27. In estimating a frame or studded wall there should be included, first, the studding, say 2×8, 12 inch centers; second, the outside sheathing of 1 inch surface boards; third, the siding of clear pine. For this example we have placed the cost of rough lumber at $18 per thousand, put up. We will assume the cost of the inch surface boards for sheathing to be $25 per thousand, including labor, nails, and material. Siding at $40 per thousand, including lumber, labor, nails, and waste. Ten feet square, or 100 superficial feet, of 2 × 8 studding, at $18 per thousand, equals $2.43. The same surface, covered with surfaced boards, at $25 per thousand, costs $2.50; 125 superficial feet of siding, at $40 per thousand, equals $5, allowing one-quarter for lap and waste. Thus we find the total cost of the frame wall to be $9.93. Add to this the cost of painting the same, one square at $3, we find the cost to be $12.93. Comparatively, therefore, we find the cost of 100 superficial feet of wall, built of the three leading building materials of the country, as follows:

Common brick	$27.00
Rubble stone	27.00
Frame	12.93

The cost of window and door frames, cornices, etc., may be estimated about the same in either building. In brick and stone buildings we find the additional cost of cut stone windows and door sills, water table, etc., but the cost of these adjuncts does not enter into the first cost of the walls, and should rather be estimated on separately or considered as additional items of cost that may be dispensed with if necessary.

Imitation Stone.

Excellent imitations of stone, marble, terra cotta, and such like, for the decoration of buildings, for statuary, and other purposes, are produced by the process invented by Mr. D. Cottier, of London. He applies powdered sandstone, freestone, brick, terra cotta, granite, onyx, or marble, sand or dust, to any interior or exterior architectural work, either curved or plain, or to buildings or structures of all sorts, or to statuary or ornaments made with stone, brick, plaster, terra cotta, cements of all kinds, or to stucco or other like compositions.

The powder or sand of any of the above mentioned substances is caused to adhere to the surfaces by means of paint made with oils, spirits, tars, varnishes, or other sticky materials which are insoluble in water. The powder or sand or dust is to be put on by a dredger, or thrown by hand instrument made for the purpose, or by an air blast, or engine driven by hand, water, gas, steam, or electricity, or otherwise. It is claimed that work so done will withstand the wear and tear of climate and weather better than any simple paint, while at the same time the natural and artistic effects gained will be evident to all. By its application to the reproduction of stone or marble statuary and ornaments, the self-same look of the originals can also be given. In these cases the stone or marble would have to be reduced to a very fine powder.

How to Grain Walnut.

It is a very difficult thing to teach graining by essay, for, as experts know, this knowledge can be obtained only by years of practice. We do not profess to be expert on this sort of thing, as it is a little out of our line, still we will do our best.

The groundwork for black walnut should be made of white lead, yellow ocher, Venetian red, and black, and should dry with somewhat of an oil gloss. In order to obtain any degree of perfection in the imitation of burl walnut or any other wood, it is necessary to procure a panel or bits of veneer, and copy the color and form of the grain as nearly as possible. The grain color should be burnt umber.

To grain in oil, mix the grain color in boiled linseed oil and turpentine, and add a little soap or whiting, or both, as it makes the color flow more freely. For distemper color, grind the grain color in ale, beer, vinegar, or whisky (the latter to be preferred in cold weather), the object being to bind the color so that it will not rub off.

Graining should be done with a free and careless motion of the hand, yet having an eye to the character of the wood to be imitated. Glazing colors are transparent, and should be used very thin, whether in oil or distemper color. Blending should be done by brushing the tip of the blender back and forth slightly over the work while it is wet. Blazing, or the light shades, are put in by sliding a blaze stick up, and bearing around to the right or left. The same motion is required in packing in the fine check grain with the side of the blender.

The tools required are a brush to put on color; sponge; buckskin, to wipe out the lights; blender, and top grainer.—*The Hub.*

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CREOSOTE WOOD PRESERVING STAINS.

Wonderful has been the artistic improvement in wooden exteriors of the last lustrum, indeed of the past ten years. We have only to look back at the houses of the last generation, with their dreary lines of clapboards covered with a monotonous veneer of thick paint, to rejoice at the changes that have occurred. Is it not perhaps a process of evolution, this abandonment of the clapboard for the shingle?

May it not be compared to the change from the rectilinear exactness of the reptile's scale to the varied and exquisite beauty of the feathers of birds?

This analogy becomes still more suggestive when we observe the beautiful results that the introduction of stains in the place of paint has accomplished. Most artistic effects have been obtained by mixing shingles stained in different tones, thus giving the soft and delicate shading seen in the plumage of birds.

A word of warning may not be here amiss in regard to stains.

First.—They should not contain benzine, as some of the imitations of creosote stain have lately done.

Second.—They should not be made by mixing dry color, English or otherwise, with linseed oil, as some others have been. Such a stain may be known by the rapidity of its settling on standing, and by having only a smell of linseed oil. Such a material is not a stain, but merely a thin paint, lying wholly on the surface and masking, rather than enhancing, the beauty of the grain.

The creosote stains are the result of many years of experience, and are the only *true* stains made for exterior work.

In color and intensity they vie with the best paints, while their effect is much more artistic and transparent. The preserving properties of these stains are perfectly understood, but not until lately was it generally acknowledged that creosote diminishes the risk of fire, while also toughening the fiber of the wood.

ARCHITECTURAL EDUCATION.

Among the many inquiries upon this topic we find upon our table one from a young man of Pittsburg, Pa., to the following effect:

"I am twenty-six years old, and would like to study architecture. I have worked two years at outside carpenter work, and am now entering my second year on inside finish, in which position I hope to remain for two years more, and during this time I desire to study such matters as will thoroughly prepare me for architectural work. I have done considerable designing, can make the working drawings, and do perspective work. Now, will you be kind enough to please inform me through your columns the proper books to study, naming them in the order in which I should study? Am now studying algebra and geometry.

"2d. Is it possible for one who has always been fond of study, and who has a general knowledge of the practical part of the business, to become an architect without professional assistance, or would it be necessary to enter an office? Is there any law to govern this?"

Here is a young man who has had some practical acquaintance with the constructive branch of architectural art. The mechanical drudgery of his work has not daunted his spirit, nor quelled the artistic instinct within him, and the query is fairly presented. How shall he gain knowledge of the coveted art? Shall we turn him over to the course recommended by our esteemed contemporary, the *Sanitary Engineer*, who says, first he must take a regular course at one of the architectural schools, four years, then the routine of a year's office work as draughtsman, then one or two years in one of the ateliers of the Ecole des Beaux Arts, Paris, and, finally, the usual round of travel and observation throughout Europe—a very good course, we will admit, for a young man who can afford to spend nine years of his life in getting ready to begin, but what of the young man who has not the nine years and the nine thousand dollars to devote to its acquirement?

Would we have had a Christopher Wren, had he been obliged to take such a course? And is it the course that makes the artist, or the man? With all due respect to the Ecole des Beaux Arts, believing it to be the best art school in Europe, and while admiring the spirit of its work, yet we must protest against its methods as being the best adapted to the future needs of our architectural students. Its efforts to galvanize the corpse of the Renaissance can be of little value to the wants of our own country. As Owen Jones well says, in France drawing schools exist in every town, where the young may obtain much elementary knowledge, and there are in Paris many studios where professors devote their time to the instruction of a large number of pupils, making them thoroughly acquainted with the works of every period, and giving them a thorough knowledge both of architecture as a fine art and of construction in theory. The difficulty with our lack of progress in architectural art lies not so much with architects as with the public, and it is our people, as a people, who need to be architecturally educated. The beginning of such an education lies naturally in our public schools, and the various schools of design now under full headway are doing encouraging work in many of the large cities of the country.

Again, we must take exception to the remark of our contemporary that "an exhaustive technical, or, rather, engineering, education is apt to be a hinderance rather than a help. Aside from a certain limited amount of calculation, the engineering ability involved in the construction of even the heaviest buildings is a matter of experience and judgment rather than of abstract learning"—a doctrine which implies that skill in fine art means deficiency in practical matters of construction, and which we believe is pernicious to the highest degree.

For example, how easy it would be to a man who was simply a colorist, a decorator, or a designer, but deficient in the technical art of stone cutting, to have designed the beautiful marble stairway in the *foyer* of the Equitable building, and to have determined the proper size of its voussoir steps, and the thrust of its low segmental arch, and the proper thickness of the wall to sustain its thrust, and, on the other hand, how absurdly difficult it would be for the technically educated engineer-architect to have designed such a beautiful structure! Forsooth, what does an engineer know about Mexican onyx balusters or endolithic marbles?

One of the most prominent architects in this city, a graduate of the Ecole des Beaux Arts, is of the opinion that the technically educated mechanical or civil engineer, with an ardent love for architectural art, has received the best preparation possible as an introductory to his architectural studies and future career. Safe building construction is not second to artistic creation, and the man who can accomplish the latter without the former is not entitled to the name of architect. To design the former necessitates the technical knowledge, training, and thinking of the engineer. To attain the latter, simply a knowledge of the artistic work of all ages, with the spirit and instinct of an artist within him. On the other hand, it is equally true that a man deficient in the faculty of æsthetic expression can never attain an enviable height as an architect. He must have within his own breast an inherent love of the fine arts, but all the schools in the world, not even the Ecole des Beaux Arts, can make an artist-architect of a man who is not endowed with a keen sense of harmony of proportion, color, and expression before he goes there. Architecture is nothing if not an expression of individualism. True it is, traditions, precedents, and the art expression of all the ages come down to the individual, and it is the impression of them all upon himself that is worked out in that individualism. It is, finally, an ideal creation manifested through the image of one mind, consonant with the instinct of one soul, harmonious, beautiful, not the confused, distorted, inharmonious conception of many minds acting together in patchwork order, not that monster of modern times "administrative" architecture.

Before us lies the memorial resolution of the American Institute of Architects, adopted in honor of the late Mr. Ferguson, than which no brighter name adorns the page of architectural fame of the nineteenth century, and, in the words of that resolution, "his 'History of Architecture' forms the highest authority on the subject for English-speaking architectural students and connoisseurs," and yet "a most notable fact in connection with Mr. Ferguson's long and highly honorable career is that he was not educated to architecture, either as a practitioner or an amateur, but to mercantile pursuits, and that he voluntarily gave up fine prospects in this direction for the sake of devoting himself to the disinterested study of architecture and to the literary elaboration of the history of its forms." But if the architectural student has carefully read the statement that he must take a nine years' course of study before he can accomplish anything, and yet

stumble upon the fact that our best authority upon architecture not only did not take this prescribed course, but was not even a practitioner, or, stranger still, an amateur, he will be sorely puzzled.

Should the student happen to learn of that *chef d'œuvre* of architectural books, Viollet Le Duc's "Discourses on Architecture," he will discover no sickening masquerading with truth and sentiment, but the principles of truth, unity, and beauty, each allotted to its appropriate place, each characteristic of good architecture, truthfully, carefully drawn; and no writer ever lived who more fully despised the deceits of false art, its shams, and its hypocrisy than Le Duc, and he it is who announces that a building, to entitle it to rank among architectural work, must, first, be safely built, second, durable, and, lastly, beautiful—the relative importance existing in the order named.

Reader, were you ever a builder? and have you tried ever to interpret and execute some detail that the poetical architect has just "*sketched in*" for picturesque effect? If you have not, just try it; if you have, what did you say, and what did you do? An eminent writer in an English architectural journal recently said: "If knowledge of construction is thus essential to the architect on the utilitarian side of his art, it is not less necessary in an artistic sense. Not only is it important to know in what positions of a design certain materials may be safely used, but also what will be their appearance and effect. The former requirement applies to the scientific, the latter to the artistic element in architecture. Do you not see how carefully the line is drawn? Art and science are sworn enemies. Designs which may be effective in one material will be unfitted for others, but you know it will be very scientific to be acquainted with the nature of your material, its durability, the tests which it may have been submitted to by scientific men; but it will shock your artistic sense to know it, so if you are going to be an architect you must not know it. It is very vulgar to know anything about it. Faults of execution may interfere with well studied detail. Oh, yes; your detail must be masterly studied, must be skillfully colored, no striking contrasts, you know. But, if the execution is faulty, why—blow up the builder, or contractor, or what not. Color may be well or ill introduced, but it will violate the canons of propriety for you to study the physical laws of color harmony. That is scientific, but it is low art. Magnificence or meanness of effect may be produced by the dimensions or quality of the materials used, but you must never study the anatomy of proportion, that would be scientific. The end justifies not the means, but the means the end in architecture."

If the above were true, architecture would be destitute of principles, and how can the application of the knowledge of principles, which is the expression of art, exist without principles? Ah, but some writers will tell you art is above all principle, transcends all knowledge, and, therefore, it must be out of sight, invisible, intangible.

In truth, what shall a young man study who desires a fundamental knowledge of architecture? In the special course at Cornell University, the following subjects are mentioned: Building materials and construction, mechanics, designing, shades, shadows and perspective, free hand and linear drawing, decoration, photography, modeling, acoustics, Egyptian, Greek, Roman, Romanesque, Renaissance, Gothic, and modern architecture, and the books from which to study them are:

Ferguson's "History of Architecture," Viollet Le Duc's "Discourses on Architecture," "The Principles of Design in Architecture," by E. L. Garbett, Wightwick's "Hints to Young Architects," Lubke's "History of Architecture," Winckleman's "Ancient Art," Reber's "Ancient and Mediæval Art," Stevenson's "House Planning," Street's "Brick Architecture of the Middle Ages," Gell's "Pompeiiana, Photographic Prints of Greek and Roman Remains," Grote's "History of Greece," Ibne's "History of Rome," Pugin's "Gothic Architecture," Parker's works on "Gothic Architecture" and "Domestic Architecture of the Middle Ages," Rivington's "Building Construction," Clark's "Building Superintendence," Barlow's "Strength of Materials," Stoney on "Strains," Shreve on "Roofs," Prof. Ricker on "Graphic Analysis of Roof Stresses," Wood on "Resistance of Materials," Goodeve or Twisdew on "Elementary Mechanics," Weishach on "Higher Mechanics," Helmholtz on "Acoustics," Tyndall on "Sound," Miller on "Essentials of Perspective," Day on "Design," Japanese art decoration, Builders' Edition of SCIENTIFIC AMERICAN, *American Architect, Building, Carpentry and Building*, the *Sanitary Engineer*, *Decorator and Furnisher*, *Moniteur des Architectes*, *Materiaux et Documentes*, and latest works on electric lighting and house sanitation.

In the opinion of the writer, who, if he were a graduate of the Ecole des Beaux Arts, would be of the same opinion still, it is quite possible to become an architect without professional assistance, but he would advise a year of conscientious work and close application under the kindly directing guidance of a practicing architect, as the routine of office work will be of great value. The current architectural literature of the day is the most valuable and available avenue now open to theoretical and practical knowledge of architectural scientific art and artistic science. Its progress, enlightenment, and wise counsels have elicited the admiration of Europe, and should not be neglected at home.

A TWELVE HUNDRED DOLLAR HOME.

On a portion of our colored plate is shown a little house which has been specially designed with the view of providing a dwelling at the lowest possible cost consistent with sound construction. The architect has taken the minimum requirements to be a kitchen, a living room, and three bed rooms—one for the parents and one for the children of each sex—and has produced a design which, while possessing a pleasing appearance and a convenient arrangement, may be carried out at the low cost of rather less than twelve hundred dollars. This sum is that within which the house could be built in almost any locality, but in many places $1,000 would easily cover the expenditure.

The floor plans show the desirable arrangement adopted; the little hall, the small wash room, and the nice sized pantry, are conveniences which cost little, but add much to the comfort and completeness of the house, while the position of the stairs permits of the upper rooms being warmed to some extent from the kitchen heat below.

Full specifications and bill of cost will be found below, which, taken in connection with the accompanying sheet of elevations, plans, and detail drawings, will be amply sufficient to build from.

SPECIFICATION

of material to be provided and labor to be performed in building and completing a one and a half story and cellar frame dwelling house.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, and, taken in connection with this specification, to provide for the completion of the entire carpenter, mason, painting, tinning work, etc., as well as everything mentioned in this specification. Any work shown on the drawings and not mentioned in the specifications, or *vice versa*, is to be executed the same as if both mentioned in the specications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever.

Quality.—The whole of the work is to be executed in a good, thorough, and workmanlike manner. All the materials used to be of good quality, free from all defects impairing their strength or durability. The timber, except where otherwise specified, to be of good, well seasoned hemlock.

Sizes.—Plates and interties, 4"×4"; posts, 4"×6"; first and second floor beams, 2" × 8", all 16" on centers. Rafters, 2" × 6"; valley rafters, 2"×8", 24" on centers; all studding, 2"×4", 16" on centers; bridging, 2"×2"; ridges, 2" x 8"; and ceiling beams, 2" × 6".

Framing.—All the studding to be placed 16" on centers; door and window studs, 2" × 4", doubled, including the heads; all partitions to be bridged horizontally once in their height with 2" × 4" bridging, well nailed at each end. Partitions coming over one another to rest upon the partitions below, and not upon the floor beams. All floor beams to be bridged with one tier of herring bone bridging in center, well nailed at each end. The entire frame to be mortised, tenoned, and pinned together with horizontal pieces 2" × 4", cut in on height on first story 3' from centers, to nail vertical boards to. The trimmers, headers, and beams running under and parallel with partitions to be doubled beams, well spiked together. All floor beams to be laid with crowning edge up, and all studs to have hollow sides out. All sills to be halved at angles and corners, and the rafters to be neatly fitted to ridge and plate valleys, ceiling beams to be well spiked to side of rafters.

Flooring.—First and second floors to be laid with wide pine flooring, ⅞" thick, well driven together and nailed to each and every beam.

Siding, Shingling, etc.—Do all necessary furring, and shingle the vertical sides, where shown, with XXX 18" pine shingles; the bottom course to have rounded ends and to be laid not more than 5" to the weather, on 1"×2" laths, 5" apart. Cover the lower portion of the building where shown with narrow tongued and grooved ⅞" boards, driven perfectly tight together. No battens to be placed over joints.

Roof.—The valleys and gutters to be lined with the best I. C. charcoal tin, with all joints carefully soldered. Do all necessary flashing around chimneys, cheeks, etc. Shingle the entire roof with XXX 18" pine shingles, laid on 1"×2" lath, not more than 5½" to the weather. Put up, where required, 3" tin leaders, and connect with drains where directed.

Piazza.—The sills and bearing timbers for porches to be 3"×6", floor beams 3"×6", placed 20" from centers, notched into the sill and well nailed; the floors to be ⅞" thick, 4½" wide, laid in paint, and blind nailed. Steps to have 1¼" treads and ⅞ risers; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details; the piazza to be ceiled level on the under side with 4½" beaded ceiling, ⅞ thick. The ceiling beams to be 2"×4".

Blinds.—All windows except those in cellar to have 1¼" outside blinds, made, hung, and fastened in the best manner and painted three coats at the factory.

Exterior.—The water table, corner boards, cornice, window frames, porches, and all other exterior ornamental work to be made of merchantable white pine, in accordance with the drawings; the ends of rafters overhanging the plate to be worked as per detail.

Window and Door Frames.—Window frames to be made for 1¼" double hung sash, with 1¼" pulley and hanging stiles; 2" sills, and ⅞ subsills; 1¾" axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside and hung at top with 3" narrow butts and proper fastenings. Door frames to be made of 1¼" plank, with rabbeted jambs; outside doors to have 1¼" outside casings.

Sashes.—All sashes, except those in cellar, to be 1¼" thick, of the dimensions and number of lights shown in drawings, and to be glazed with third quality French single thick glass; cellar sashes to be glazed with fourth quality glass. The double hung sashes to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts.

Doors.—The front door to be 1½" thick, moulded as shown on drawings, and hung on 4" cast loose butts, fastened with 4½" brass face mortise lock, and fitted with porcelain furniture and drop escutcheons. Closet doors to be 1¼" thick, paneled and moulded one side, hung on 3½ cast iron butts, and fastened with 4" rim locks, with porcelain furniture for principal part of first story and mineral for second floor. Kitchen closet doors to be white porcelain reverse bevel rim locks. All doors, where needed, to have rubber tipped base pins and ash saddles.

Stairs.—Build the stairs as shown on the plans, from first to second stories with 1¼" treads, ⅞" risers, and 1¼" strings, put up in the best manner, with the steps wedged with glue. Put in newel on second story with handrail, and plain balusters of ash, as shown on drawings. Cellar stairs to be rough spruce plank steps, housed into strings.

Trimmings.—The architraves for all doors and windows throughout the house to be 5" wide, with bead on each edge. First and second stories to have turned corner blocks. The bases to be 6" wide, moulded on top. All to be of well seasoned and clear white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on three sides as directed. Bed room closets to have one shelf with strips fitted with japanned hooks for coats and hats. Wash room to have strip with wardrobe hooks screwed thereto.

Grading.—The grading will be done by the owner.

Mantels.—Put up shelves around chimney and support same on brackets.

Privy.—Build privy 4' 6"×4' 6"×6' 6" high, of narrow beaded ceiling, and shingle roof; provide one small window to slide, and finish complete; put in batten door hung and latched complete; ceil the overhead part and floor the bottom; put in seats, two large and one small, these to have hinged covers, holes, and risers complete.

Back Panels.—All the windows to have neat moulded stools and aprons.

Painting.—Paint all the exterior woodwork usually painted, including privy, with two good coats of best "Atlantic" white lead and linseed oil paint; shellac all knots and sap before priming; and putty over all cracks, joints, nail holes, and nail heads after priming is done. Paint all tin-work with two coats of Prince's metallic paint, and the chimney with two coats.

All the colors are to be selected by the owner. The blinds will be painted at the factory. The whole of the interior work to be painted with two coats of such color as the owner may select. All the doors and saddles to be oiled, and the whole of painting to follow immediately after the carpenters.

MASON'S SPECIFICATION.

Excavations.—Excavate to a proper depth, as shown on plans, for the cellar proper, which is to be about 4' 6" below ground. Excavate for all foundations of piers, etc., 2' 6" deep, and stoop foundations, 2' 6" deep. All water that may accumulate during the excavation, from any cause whatever, to be removed at once, and the premises kept dry.

Brickwork.—Build up 8" cellar walls, of good hard burnt brick (those generally used in the vicinity), to the full height of cellar, which will be seven feet in the clear, bricks to be laid in cement and lime mortar, mixed with sharp sand. Brickwork to have a course of headers in every seven, to be finished with struck joints inside and out. All angles and corners to be perfectly plumb and the walls level on top.

Brick Piers, etc.—Build brick piers where shown on plans, of good hard burnt brick, of dimensions indicated. All piers outside to be excavated for at least 2' 6" deep, and filled in with small stone and well hammered down to a solid bed.

Stoop Stones.—Put down stoop stones where shown, with foundations at least 2' 6" deep, filled in with small stones. On this lay flags, in two lengths, and 2' wide, and of the full length of each stoop. Furnish and set bluestone sills to the cellar windows.

Chimney Flues, etc.—Build chimney flue as shown on plans, of good hard burnt brick, with joints struck smooth, and capped with bluestone cap, 3" thick, with hole cut through.

Furnish and set a thimble where directed.

Vault.—Excavate and build privy vault where directed, 4' deep, and projecting back 2' in rear; this opening to be covered with a box neatly fitted.

Lath and Plastering.—The entire house to be lathed and plastered, except cellar, with one coat and hard finish; all done in the very best manner, and with the best materials. The mortar to lie at least one week before using.

Generally.—The mason will make all his work good after all other trades are done, and leave the building broom clean immediately after the plastering is finished.

Estimate and Bill of Materials.

MASON'S WORK.

No.		At	
50	yards excavating	$0 25	$14 00
8,000	bricks for foundations, laid	15 00	120 00
7	outside piers	2 50	17 50
1	chimney	..	17 00
4	bluestone sills	1 10	2 40
356	yards plastering, two coat work	30	106 80
	Cistern, finished complete	..	40 00
			$317 70

CARPENTER'S WORK.

2	2"×8"×24'=	04 ft.		
2	2"×8"×14'=	37 "		
1	4"×6"×18'=	36 "		
1	4"×6"×14'=	28 "		
1	4"×6"×16'=	32 "		
38	2"×8"×14'=	710 "		
6	4"×6"×15'=	180 "		
6	2"×6"×20'=	120 "		
8	2"×6"×23'=	184 "		
8	2"×6"×26'=	208 "		
6	4"×4"×14'=	112 "		
4	4"×4"×12'=	04 "		
1	4"×4"×18'=	24 "		
1	4"×4"×24'=	32 "		
6	2"×6"×16'=	96 "		
275	2"×4"×12'=	2,200 " = 4,127 feet hemlock timber.	$15 00	$61 91
	850 ft. vertical siding		30 00	25 50
11,000	18" pine shingles		4 50	49 50
300	1"×2" shingle laths		4½	13 50
1	turned piazza column		..	2 25
10	ft. piazza rail		..	5 00
1	short column		..	1 25
4	piazza brackets		55	1 20
100	ft. water table		4	4 00
100	" band course		5	5 00
8	small cornice brackets		50	4 00
100	ft. main cornice		20	32 00
100	" of tinning		6½	6 50
30	" " 3" leader		10	3 00
2	sets of steps, complete, ready to put up		..	6 00
10	ft. lattice under stoops		20	2 00
60	" piazza ceiling		3	1 80
60	" " flooring		3	1 80
4	cellar windows, complete		..	6 00
7	first story windows, complete, with blinds		7 00	49 00
8	second ditto, ditto		7 00	56 00
1,000	ft. flooring		3 00	30 00
12	doors, complete, with trimmings		..	48 00
225	ft. surbase		3 00	6 75
	Main and cellar steps, complete, with ceiling and rail		..	26 00
	Shelving, kitchen pantry		..	3 50
	" two closets on second story		..	3 00
3	shelves around chimney		..	6 00
	Pump and sink, complete		..	25 00
	Labor for all carpenter work		..	250 00
	Incidental items, jobbing, etc		..	60 00
				$795 46

SUMMARY.

Mason's work	$317 70
Carpenter's work	795 46
Painting	60 00
Total	$1,173 16

A FIVE THOUSAND DOLLAR RESIDENCE.

This picturesque and attractive residence was designed for Mrs. W. B. Chapin, of Pomfret, Conn., by Howard Hoppin, architect, of 33 Westminster Street, Providence, R. I. The treatment of the elevation is most pleasing, the arrangement of the roof lines producing a very graceful effect, while the dwarf stone wall surrounding the piazza gives the whole design a very substantial and superior appearance.

The cost of the house is estimated at $5,000, made up as follows:

Mason.

Grading	$60 00
Excavation	70 00
Stonework	425 00
Brickwork and chimneys	225 00
Concrete, cementing, etc	100 00
Lathing and plastering	385 00
Outside plaster	45 00

Carpenter.

Heavy timber	400 00
Joists and flooring	370 00
Studding and boarding	275 00
Shingling sides	75 00
" roof	175 00
Outside finish	250 00
" mouldings	50 00
Sashes and frames	280 00
Doors, frames, and trimmings	325 00
Outside finish	250 00
Staircases complete	175 00
Mantelpieces	100 00
Tinning, gutters, conductors, etc	75 00
Plumbing	420 00
Painting, papering, etc	300 00
Incidental items	170 00
Total	$5,000 00

Mr. Hoppin, the architect of this house, has a very extensive practice in Rhode Island, Connecticut, and elsewhere.

Among the buildings for which he is responsible are the Union churches at Fruit Hill, R. I., and Buttonwood, R. I.; the Episcopal churches at Warwick Neck, R. I., Compton, R. I., Apponaug, R. I., Abington, Conn., and Riverside, R. I.; the residences of Bishop Clark, of Rhode Island, Mortimer Hartwell, Esq., Henry C. Bowen, Esq., and a large number of other extensive and important erections.

Specification.

MASON'S WORK.

Loam.—Take off, remove, and pile on lot where directed, all turf loam from under building and for 20 feet around same

Excavation.—Excavate, remove, and pile where directed on lot, all soil, gravel, clay, loose stones, etc., for cellar to house, as shown, and for trenches, piers, and foundations.

Trenches for walls to be dug 6' below cellar bottom. On outside of cellar all trenches to be at least 3' below grade.

Footings.—Bed on solid bottom, a footing course of good levelers under all walls, chimneys, piers, and foundations.

Cellar Walls.—Build cellar walls and foundations as shown, of good ledge and field stone, showing rough rubble on outside, all to be 18" thick, and in half and half mortar up to sill. Rubble to be rough, with carefully bonded joints.

Wall Drain.—Dig a trench from outside foundation walls 6" below cellar bottom, and fill with broken stones. Upon this put smaller stones, then hay, and fill up over with dirt. Level up all around house with pitch away from house. At southeast corner of drain dig trench from drain, with good pitch for 50 S E., and fill in same in the same way.

Cementing Cellar Bottom.—Cover the whole of cellar bottom with a layer of cement, composed of two parts of sand to one cement. Lay even to a depth of 2" thick. Also cover whole piazza floor with same, 3" thick, and with good pitch, to outlet marked.

Cistern.—Excavate for and build a cistern 6'×8'×10' deep, also a cesspool of same size and material. Both to be of stone laid in lime mortar, and thoroughly cemented both on bottom and sides. Build 8" brick arch over top of each, with manhole, with iron rim and cover.

Overflow from Cistern.—One inch below inlet of water to cistern put in 3" tile drain pipe, and dig trench and lay a line of 3" tile pipe from same to grade with pitch from cistern to W. or S.W. of house. Protect outlet by heavy wire netting, with tile rim over end of pipe at grade, to keep out dirt, etc.

Caps to Stone Posts.—Furnish and put on with cement two terra cotta caps to front stone posts, and allow $25 for same.

Drains.—Lay a 4" tile drain from 6' above ground, where shown, to cesspool and connect same. Put in Y branch where shown, and lay a 2" branch from same to waste from kitchen sink. At S.W. corner of house lay a line of 4" tile pipes to join conductor to cistern. Both lines of pipe to be carefully and securely laid with close cemented joints. All joints to be wiped out as each pipe is set.

Chimneys.—Build chimneys as and where shown, of any good hard body brick acceptable to architect. The brickwork showing outside of house to be selected to even color and laid in red mortar.

Outside Plastering.—Provide and put on outside plastering, half lime, half Portland cement. Same to be carefully put on as directed by architect.

Fireplaces.—Build four fireplaces, as and where shown, of same brick, selected to even color and laid in red mortar with brick hearths. Flues to be 8"× 12", parged up full length. Exterior of chimneys (inside of house) to be plastered up full length.

Thimbles.—Provide and set 6" earthenware thimbles into flues extending from inside of flue to face of plaster, and no farther.

Lathing.—Lath both walls and ceilings of first, second, and third stories, also laundry and cellar, with good spruce laths, securely put on. Plaster the whole of the above with a good heavy coat of hair mortar, carefully put on and evened off. When this coat is dry, go over the whole with a good even coat of lime putty, leaving the whole even and clear.

Furnace.—Set a portable furnace (supplied by carpenter) in best manner on cement floor, no brick.

Whitewashing.—Whitewash whole of cellar walls and ceiling (except laundry), and leave same clean and white at end of job.

Lead Flashing.—Carefully flash with lead (supplied by carpenter) around all chimneys.

Stone Steps.—Furnish and set at front of piazza a flight of granite steps as shown. To be dressed off with hammer, squared, and set with slight pitch to front.

CARPENTER'S WORK.

The whole of the timber for framing to be of good, sound quality, free from shakes, sap, and other defects. Sills, 4"×6"; girders (two), 2"×8", spiked together; posts, 4"×6"; plates, 4"×4"; studding, 2"×4" and 2"×3" (inside); floor joists, 2"×9", set 16" on centers; rafters, 2"×9", 24" on center; studding to be doubled at all openings, studs set 16" on center.

Crossbridging.—Crossbridge both floors through length of building in two lines, in secure manner.

Cover.—Cover all roofs, sides of building, and floors with ⅞" hemlock boarding, laid close and securely nailed.

Paper.—Before laying upper floors and before putting on outside finish, cover floors and outside boarding with a thickness of good heavy sheathing paper laid close, with edges overlapping.

Shingling.—Cover all roofs and sides of building as shown with good clear butts sawed cedar shingles, laid with lap of 4" on roofs, 4½" on sides.

Lead.—Furnish sufficient 4 lb. lead for mason to flash around chimneys.

Flashing.—Lay all valleys of roofs, also on all hips and ridges, with good tin, and extend on valleys 8" on both sides. Carefully flash with tin on all joints of roofs, and of roofs and sides, and lay good strips over all exposed doors and windows, and leave the whole water tight. Shingles valley to be close.

Roofs.—To be looked over carefully at end of job. To be left clean and tight, and warranted so for one year from completion of work.

Gutters.—Provide and securely put on good tin gutters to roofs, as shown, with good pitch to outlets.

Conductors.—Provide and put on 3" tin conductors. Pipes from connection with gutters to joint with tile pipes to cistern.

Furring.—All plastered ceilings to be furred, also over stone walls of laundry.

Upper Floor.—Lay a first quality upper floor ⅞" thick. Matched Norway pine on whole of first story. To be blind nailed, and no boards wider than 5". Other parts of house to have upper flooring of matched ⅞" spruce of good quality. Laundry to have ⅞" hard pine floor, on strips over cement, matched.

Thresholds.—To be of hard pine ⅞" thick.

Frames.—All window and door frames to be of good quality white pine.

Sashes.—Make, glaze, fit, and hang all sashes for building of sizes and shapes as shown, of good white pine 1¼" thick. Cellar windows to be hung at top, with button and hook, complete. Four sashes of west bed room to be hung at side with bolt and hook, as per details. All other windows to be sliding sashes, catch fastened.

Glass.—For whole of building to be of first quality, free from spot and stains.

Doors.—Doors of first story, front hall, vestibule, library, and dining room, and doors opening into same, to be moulded. All other doors chamfered. All to be stock size and finish. Vestibule and front doors to be gotten out to details. Front door, 1¾" thick. Vestibule doors, 2¼" thick. Back door and cellar door, 1¾" thick. Other doors, 1¼" thick.

Hardware.—Furnish and put on all butt locks, knobs, latches, bolts, handles, catches, etc., etc., to doors and windows of whole house. Locks to be strong and of good make. Allow the sum of $1.75 per door for trimmings, to be selected by architect.

Cutting and Jobbing.—Do all necessary cutting, jobbing, and boxing for plumbing, mason, and hot air pipes.

Inside Finish.—For whole house to be of Norway pine of first quality. Casings and bases to front hall, vestibule, library, and dining room to be moulded with simple member, as per details. All other finish to be perfectly plain. Casings, 4" wide. Bases, 7" wide.

Cellar.—Build coal partitions, where shown, of 1¼" spruce plank, securely braced about 4' high. Partitions of laundry on outside to be sheathed on cellar

side up to ceiling with ⅞" spruce, also under stairs for closet.

Laundry.—Build table, as shown, of good white pine, 1¼" thick.

Stationary Tubs.—Build and set up three wash tubs, where shown, of 1¼" pine plank, with 10" back, board over in best manner.

Finial.—Furnish and put on a finial, selected by architect, at a cost of $15.

Wire Netting for Outside Plastering.—Upon ⅞" furring strips nail heavy ½" mesh wire netting, as per details for outside plastering.

Closets.—To be fitted up as shown, all closets (except closet of kitchen) to have 12 double wardrobe hooks.

Tank.—Build and put up a tank in third story where shown, of 1¼" pine plank, securely made, size 2' × 3' × 2' deep.

Stairs.—Stairs from first and second stories as shown with rail and balusters between, all to be of hard pine, of following sizes: Posts, 5" diameter turned. Rails, 2' × 4" stock. Balusters, turned out of 2¼" stock. Risers, ⅞"; Treads, 1¼". Make and set cellar and back stairs as shown, with plain rail and square balusters of hard pine. Treads and risers, ⅞".

Steps.—Build outside steps as and where shown of hard pine.

Fresh Air Inlet.—Partition off cellar window as shown, and provide and put in same a galvanized iron fresh air box, about 18" × 24", with "damper" to furnace.

Furnace.—Supply and set a Chillson portable furnace, No. 8, where shown, with good sized japanned registers in position and floors as marked, and connect same with furnace as marked, care being taken to protect woodwork from hot air pipes or furnaces, where nearer than 2' from same, by covering wood with bright tin.

Outside Finish.—All outside finish to be as per details, and to be of first quality white pine. Balusters of porch 2' square. Floor of porch to pitch 1½" to front. Under side of overhangs on south and west sides and overheads of porches to be sheathed with ⅞" Norway pine.

Blinds.—Furnish and hang securely outside half swivel white pine blinds to all windows, except those in cellar.

Bell.—Furnish and put on a brass pull at hall front door, with all necessary wire, cranks, etc., to bell in kitchen, and to leave all in good working order. Pull to match trimmings of front door.

Mantel Pieces.—Make and put up mantel pieces in front hall, library, and dining room, and put up shelf over fireplace in second story bed room as shown. All to be gotten out as per details and to cost $100 finished.

Glass Partition.—Make, glaze, and fit a glass partition to back porch, with door as shown.

Bath Tub, Bowl and W. C.—Seat and riser of W. C. to be hung. Bowl to have cupboard and door. Sheath around bath room with ⅞" Norway pine up to line of rail on level with top of marble backing over bowl. All wood for same to be of Norway pine.

PAINTER'S WORK.

Outside.—Give all shingles (except roofs) outside one coat of Cabot's creosote stain of number selected by architect (probably No. 321). Give all trimmings, wood finish, blinds, gutters, conductors, etc., outside two coats of first quality paint, in such color as the architect may direct. Under side of porch roofs and overhangs to have coat of boiled linseed oil, with yellow stain in it. Hard pine outside to have good coat of raw linseed oil.

Inside.—Give all sashes inside, and iron and lead pipes, etc., inside, two coats of first quality paint, of such color as the architect may direct. All other woodwork to have two coats of shellac.

Front Stairs.—To have coat of good filler, and three coats of shellac, all rubbed down with pumice and oil to dead finish.

Wall Paper.—Furnish and hang wall paper with borders, etc., as selected, on walls and ceilings, as directed. Allow the sum of 75 cents a roll put on for said papers and borders. The walls and ceilings of vestibule, front hall, coat closet, library, dining room, second story halls, dressing room, three bed rooms of second story, tower bed room of third story, and closets opening out of same, to be papered.

Give the walls and ceilings of kitchen, pantry, china closet, back entry, first story, bath room and closets opening out of all, two good coats of first quality paint, in colors selected by architect.

PLUMBER'S WORK.

Supply.—Run tin lined lead pipe, ¾" inside, from cistern to a double branch cock under kitchen sink and through same to pump at sink; from pump run a ¾" lead pipe straight to tank in second story and over top of same.

Pump.—Supply and put in a first quality force pump, of make selected by owner, and connect same with supplies as specified.

Tanks, etc.—Line tank with 4 lb. lead, in the best manner; cap other arm of branch cock under pump, and to join to second line of supply from a well if that is put in. (Supply from well to be put in by owner.)

Waste.—Provide and put in a 4" line of iron soil pipe from connection with the tile drain outside of wall under cellar floor, with quarter bend to Y branch, and from same straight up to water closet, with branch for same, and from thence straight up to and through roof and for one foot above, and securely connected and flashed at roof; provide and put in a 2" iron waste pipe from connection with the tile drain outside of wall under cellar to kitchen sink; to have Y at kitchen sink, and pipe to run to and through roof, for vent, flashed and made tight like main 4" vent.

Supply from Tank.—Run a ¾" lead supply pipe from tank to bath room, thence to supply service tank to W. C. by ¾" pipe and floating ball cock. Supply tub by ¾" branch and bowl by ½" branch from same. From bath room run to kitchen sink a ¾" pipe with ¾" branch to tubs in laundry, and with ¾" supply to boiler in kitchen. Tank to have ½" tell tale to kitchen sink.

Boiler.—Provide and put in a first quality copper boiler of 30 gallon capacity, supplied from tank as specified, and connected by ¾" brass pipe in best manner, with water back in stove. Boiler to supply kitchen sink, laundry tubs, and tub and bowl in bath room, and from highest point of same to return to and over tank in third story for exhaust.

Bath Tub.—Provide and set a first quality tin lined copper bath tub in bath room, supplied by ¾" cold and hot water, and with 1¼" lead waste by S trap directly to main waste.

Water Closet.—Provide and put in a first quality "National" water closet, supplied from service tank by chain pull through 1¼" lead pipe, and with waste by 4" lead trap to main 4" iron soil pipe.

Bowl.—Provide and set a good porcelain wash bowl where shown, with hot and cold supply as specified, and with 1¼" lead waste by S trap to under side of trap of bath tub. Bowl to have marble slab and back pieces on each side, 8" high. No countersinking.

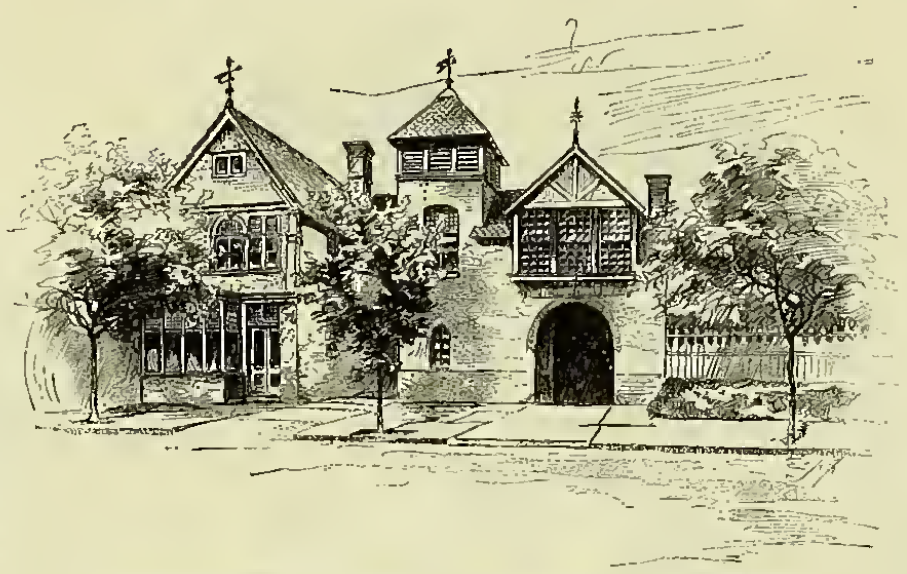
Kitchen Sink.—Provide and set in kitchen where shown an iron sink about 2'×4' with hot supply as specified, and with cold supply through double cock by pump, with 1¼" waste to 2" iron waste by S trap.

Laundry Tubs.—Connect with laundry tubs in best manner, with hot and cold supplies as specified, and with 2" lead waste by S trap main, 4" waste from bath room.

Joints.—All joints of iron pipe to be carefully calked with lead. All joints of lead pipe to be wiped.

Trimmings.—All trimmings and screws of bath room to be brass nickel plated. All other trimmings to be brass.

Back Air.—From upper bend of trap at laundry tubs to run a line of 2" iron bent pipe, straight up and to connect by easy bend to main, 4" waste above all fixtures. Connect same with upper bend of W. C. trap, and with trap of bath tub, in best manner for back airing.



DESIGN FOR A STORE AND STABLE ADJOINING.

A COTTAGE ON RIVERSIDE PARK, NEW YORK.

The Riverside Park, New York City, occupies a narrow strip of land on the edge of the Hudson River, extending from 72d Street to 124th Street. The river views are magnificent in all directions. The city building lines extend to the edge of the Park, and buildings fronting thereon may be said to stand within the Park itself. Probably there is not in any city of the world a more sightly place for private residences than Riverside Park. The Park is not yet wholly finished, and but few dwellings have been erected. One of the few is the residence of Mr. George Noakes, a sketch of which we give. It is admirably located at 113th Street, fronting the Park, which it overlooks, and from its windows and balconies the prospect is grand. The broad bosom of the Hudson River appears in view in all directions, giving the impression of a great lake.

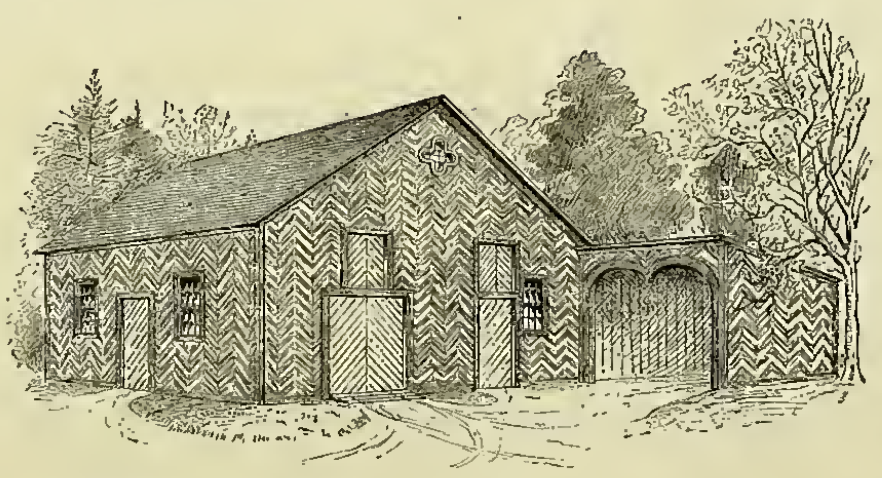
The house is built of granite, and was designed by A. B. Jennings, architect, New York.

STORE AND STABLE.

This design for a store, with a stable adjoining, is rather pleasing. It is from a recent issue of the *Sanitary Engineer.*

CARRIAGE HOUSE AND STABLE.

A friend in New Hampshire sends us this sketch of the building, which stands near a little grove in a picturesque location. The walls are double boarded and battened. In place of clapboards, pieces of birch and pine are nailed to the outside, as shown in the picture. The pieces were cut 18 inches long, and split. This covering gives a neat and rustic appearance.—*Rural New-Yorker.*



A CARRIAGE HOUSE AND STABLE OF MODERATE COST.

The Silver Birch.

I have often felt surprised that this tree should not be more extensively planted in pleasure grounds, parks, and on large estates generally than it is. In manner of growth it is so graceful, so distinct from all other forest or hardy trees, as to render it eminently fitted for purposes of isolation. A large well-developed tree, so placed that its natural habit is fully displayed, forms a very pleasing feature in the garden landscape, not only when in full leaf, but also during the winter months, when, denuded of foliage, its characteristic features are more fully revealed. The graceful, spray-like, pendulous growth and silvery bark show up charmingly against the fresh bright turf of a well kept lawn, a tree dotted here and there about pleasure grounds doing much toward relieving them of their sameness, and, where evergreens are largely employed, the rather somber aspect during the dull months of the year. There are, however, a variety of ways in which the silver birch might be employed. It has a very pretty appearance when so placed among coniferous trees and evergreen shrubs that they form a background to it, in such a manner that the head of the birch stands out clear and well defined, while the white stem is, as it were, framed in verdure. In parks, good use might be made of this tree by grouping it here and there in such a manner that the bright stems would be distinctly visible when the foliage was off. I may mention, however, that there is considerable variety among the silver birches, some having the bark much more silvery than others, and having consequently, from an ornamental point of view, a much higher value. It is a pity that seeds should be saved from inferior varieties.—*J. C., the Garden.*

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DWELLINGS AT EVANSTON, ILL.

In the *Building Budget* for April we find a very pleasing group of semi-detached dwellings, which we here reproduce. They are of moderate cost, but substantial in structure and appearance. It is pleasing to note how rapidly the erection of handsome dwellings is progressing in Evanston and neighboring places.

The Architect and House Drainage.*

It is very evident that the most important part of an architect's labor is that which concerns his client's health and comfort; therefore, the architect ought to be familiar with all the details of his work; for on him rests the responsibility for the healthfulness, comfort, and cost of the work over which he has charge, and in a degree for the general standing or rank of the art of plumbing throughout the country.

In planning for a house, some of the first and most important details to be considered are its location, character of the subsoil, construction of foundation, and means for preventing dampness of walls, properly lighted cellars, ventilation, drainage, water supply, arrangement of plumbing fixtures, the instant removal and proper disposal of water after it has performed its duty, being then fouled and mixed with excrement, greasy matter from the kitchen and pantry sinks, after its use in the bath tubs, wash basins, etc.

Our time will not permit taking up all these in detail, as they should be, in the few evenings you have set aside for this subject, but I hope in a general way to cover as much ground as possible, offering a few suggestions as to the mechanical execution, construction, latest sanitary ideas, and most improved fixtures inside of a building. For this purpose, let us suppose that the site has been selected and the building so far advanced as to receive, probably, the first thing to be located and constructed—the drain with its trap and fresh air inlet. This should be four inches in diameter, of extra heavy tar-coated, cast iron pipe, very rarely more than five inches, with a fall of at least one-fourth of an inch to the foot, either suspended from cellar ceiling or along the foundation wall, unless there are fixtures in the cellar. In this case, it is not advisable to bury it all below the floor.

Iron soil or drain pipes should not be made too light, for a number of reasons. They do not possess the required strength. It is impossible to cast them with any degree of evenness in thickness; one side may be one-sixteenth of an inch thick, while the other would possess its own thickness with that which is wanting or taken from the other side. When cast so thin, they are as hard as chilled iron, and about as brittle and difficult to cut as glass; a slight blow with a hammer or knock would crack and splinter them in atoms. They are more likely to have sand holes and, on the whole, are utterly untrustworthy at all times. The additional cost of extra heavy iron is only for the iron—the labor remains the same.

The trap should be located just inside the cellar wall, or outside the house in a man hole with a fourth inch fresh air inlet branching from it as close to the inside of the trap as possible, to secure a free circulation of air throughout its entire length, and carried outside the house two feet above the surface of the ground, away from windows.

It is a common practice here in Philadelphia, as well as in New York and some other cities, to locate the fresh air inlet at the edge of the pavement or at the face of the curb, and covered with a perforated plate. They are sometimes closed for days in bad weather by snow and ice, and I have not the least doubt that some of them are closed, or nearly so, the year round by mud and rubbish. When this occurs, their usefulness and security cease. The proper place is certainly above the surface of the ground, and not too near windows or doors.

All branches entering this drain should be made with Y-fittings, and never with T's. All vertical lines of soil and waste pipes should be turned at their base to a horizontal one with long ¼ or ⅛ bends of a large radius and running in the most direct and straight line to and through the roof, full size, above the highest point, remote from the windows, ventilators, and chimneys. If alongside the chimneys, keep the soil pipe well below the top, on account of a down draught, which has been known to occur quite often in practice, especially in the unused flues for open fireplaces.

* Address by Geo. F. Brown, sanitary engineer, before the Philadelphia Chapter of Junior Architects.

The tops of these pipes ought to be left perfectly free and open without cowl or ventilator, which not only aggravates the circulation of air, but affords a good place for the accumulation of hoar frost, by the warm air from the drain in severe cold weather. I know of an instance where the cowl was so incased with ice as almost to make it air tight, and the result was the siphoning of a number of traps. Col. Waring says that all vent pipes, of whatever size, ought to be increased two sizes as they pass through the roof, and, by experimenting, it was found that a universally effective increase of the movement of air is secured by increasing the diameter of the pipe at its upper end.

It is also a well known fact that every deviation from the straight line obstructs the current by increasing the friction. Therefore, the cap, or bend, or cowl, one or another of which is almost always used, is of no real utility in a high wind, and is an absolute obstructor during light winds or calms. The best results will always be obtained by running the soil pipe straight up to a certain elevation above the roof, more or less according to the exposure, and leaving it entirely open at the top; or, to prevent accidental or intentional obstructions, where it is likely to occur, the ordinary spherical wire basket should be inserted into the mouth of the pipe and securely fastened.

The horizontal drain in the cellar should be suspended from the ceiling by strong wrought iron double hangers, dogged to the timbers at least every ten feet; or, if along foundation walls, supported by brick piers or strong wrought iron rests driven well into the wall between the joints.

The vertical line of soil and waste pipes ought to be supported at their base by brick piers or stone posts, to carry their weight, and not depend on the frail clamps which are very commonly used by some plumbers. The settlement of soil pipes has very often caused serious trouble (in good work every other way), by the neglect of the workman giving it the proper support at its base during its construction. In jointing cast iron pipe, the spigot end of one pipe must enter as straight as possible into the hub end of the next, to secure a perfect joint. In any change of direction in a line of pipe, the proper bends must be used, of which there are enough varieties in the market to form almost any angle.

On one of my inspections not long ago, I found a joint so calked as almost to close one side of it, which, of course, must be imperfect, for though the lead did completely fill the joint, it was impossible to calk it tight at the contracted part. In making these joints, a gasket of oakum or hemp should be well rammed in first to about one-third its depth, to prevent the molten lead from running inside the pipe—the rest of the space filled with soft pure lead and thoroughly calked, or about one pound of lead to every inch diameter of pipe. In a residence in Boston a few years ago, in applying the water test, I found that almost every joint leaked more or less throughout the whole system, owing to the fact that the plumber, either by mistake or economy, used old lead mixed with tin, zinc, or some other hard metal in making the joints, which, of course was so hard as to prevent his calking it with any degree of safety without bursting the hubs. These joints can and should be made tight without the use of putty or paint. I would suggest that they never be treated with cements of any kind, but left exposed, showing the marks of the calking tool in the lead, and after the lead wastes are calked into their respective branches, subject the whole system to a water or peppermint test, and inspected by the superintendent or engineer. In passing through the foundation wall, the opening should be enough larger than the outside diameter of the pipe to allow the walls to settle without crushing or deflecting the pipe.

In my estimation, based upon experience and careful examination of good work, the best sizes and weights of lead waste pipes for the different fixtures are as follows:

For sinks—kitchen, scullery, and pantry—1½ inch, 3 pounds per foot.

Bath tubs, 1½ inch, 3 pounds per foot.

Wash basins, 1¼ inch, 2½ pounds per foot.

Row of basins, 1½ inch, 3 pounds per foot.

Urinals, 1½ inch, 3 pounds per foot.

All waste pipes should have a sufficient fall to insure the running off of all water and leaving them stand empty. Avoid long horizontal runs by placing fixtures as near as possible to the vertical lines, and keep them open and above ground or floor. No pipes should be concealed behind anything but a hinged casing, or, if under the floor, provided with a continuous support on boards with proper grade, and the boards covering them screwed down for examination or repairs.

All jointing of lead wastes should be made by wiped joints and connected to the iron with a brass ferrule or sleeve, soldered to the lead pipe and then thoroughly calked into the iron pipe with molten lead.

There are some fixture and waste pipes that to connect them with the drain would be very apt to cause serious results. For instance, the refrigerators ought never to be connected directly with any drain or sewer, but may waste into a pail or zinc pan movable by hand, or into an open sink, or the open air. Large sizes, say for hotels, where it is impossible to do otherwise than waste into a drain, they should first waste into an open pan or cup below the water line, and that be connected to the drain by a deep sealed trap. A stop cock may be placed in this pipe, so that when not in use it can be cut off from the drain, independent of trap.

Overflows from tanks, drip pipes from safes and floor linings, sediment, or waste pipes from boilers, must never be connected under any circumstances with the drain. The former can be discharged into the gutter of the roof, an open sink, or the open air. This case only applies to storage tanks for drinking and cooking purposes.

Water closet tanks are provided in themselves to overflow into their bowls. Drip pipes, or, in other words, tell-tales, which they are, should terminate just below the ceiling of the basement or cellar, either with end left open, or, perhaps, a better way is to turn the end up, forming a trap, and then caging a rubber ball on top. This is merely to cut off the circulation of air from the cellar, or the odors from cooking in the kitchen rising through this pipe into the rooms above.

Boiler wastes, or the sediment pipe, can discharge into an open sink if convenient, or in place of this, and a simpler way, is to insert a common hose bib or faucet into the cold water or lower pipe leading from the boiler to the range.

FINAL RULES.

All fixtures should be located as near as possible to the soil pipes, both for economy and safety. On the score of economy, the saving should be in quantity, and not in quality. Concentrate all plumbing on each floor as near to the vertical line of soil pipe as possible, and make one stack of pipe answer. Secure the utmost simplicity consistent with needed convenience. One soil pipe with one bath and two closets, all of the very best, will answer the necessary uses of a large family, and will be safe. Two stacks with half a dozen closets and baths, if as good, will cost vastly more and will be less safe.

On the score of safety, one stack will be more regularly used and flushed than two, consequently cleaner.

Secure an absence of dribbling streams, and use fixtures that produce the most copious flushing when used; the freest possible circulation of air in all parts of the system, except so near traps as to evaporate their seals; the absence of all avoidable casing, and above all get all the wastes completely out of the house before they begin to decompose. Let the water closet be as smooth and plain and fair as a new egg, and the waste pipes stand empty when not in use.

SEMI-DETACHED DWELLINGS, EVANSTON, ILL.—A. M. F. COLTON, ARCHITECT.

A CORRESPONDENT of the *Country Gentleman* tells of butter pressed in a mould so as to look exactly like a large fine strawberry. One of these berries was put by the side of each plate, and an extra supply stood in the center of the table on a fruit dish. Gilt edged butter, in such fancy shape, should sell for high prices.

A DWELLING FOR THREE THOUSAND DOLLARS.

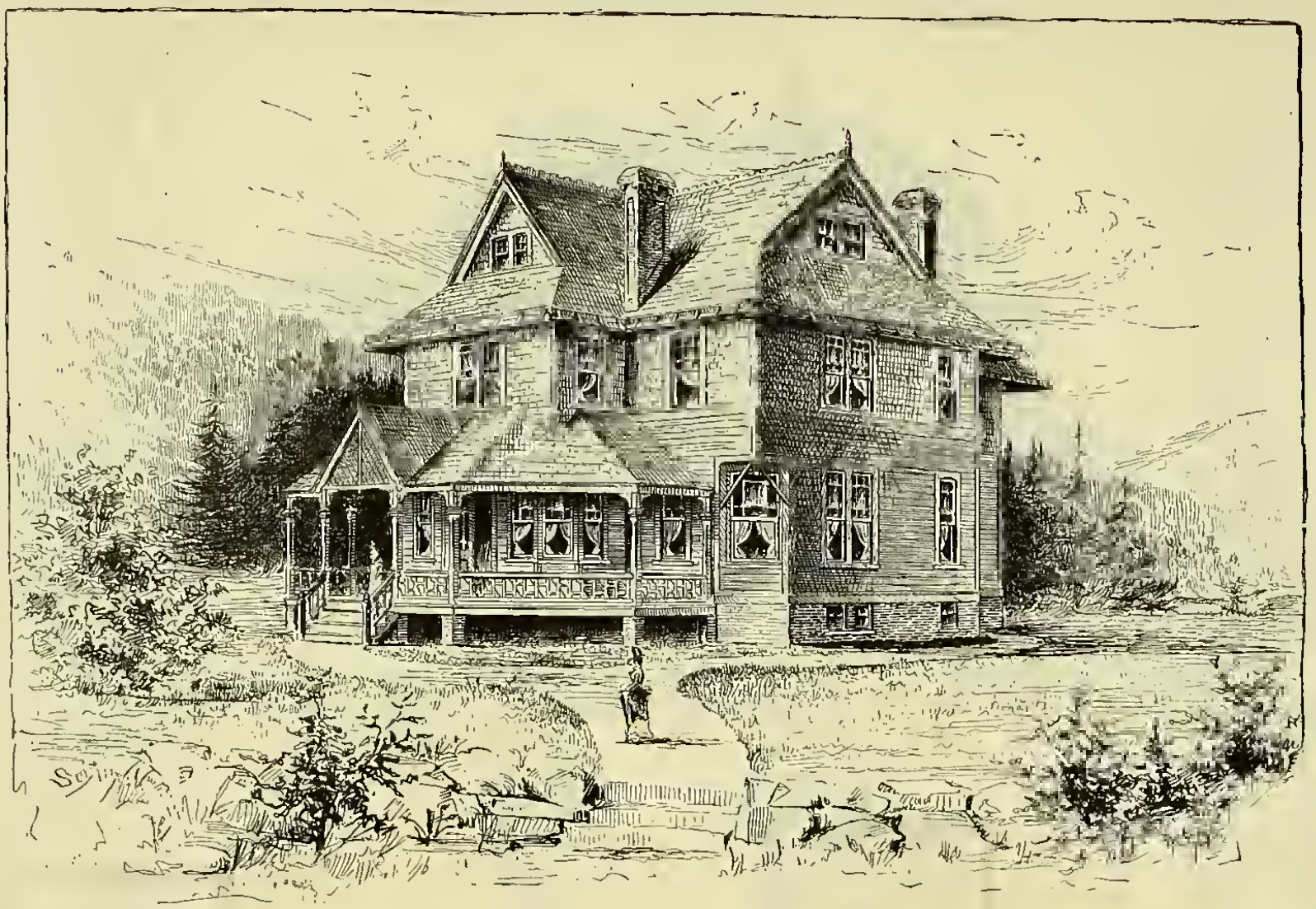
This attractive little residence was erected a short time since at Portsmouth, R. I., from the designs of George W. Cady, architect, of 164 Westminster Street, Providence, R. I., at a cost of rather less than $3,000. The rooms, as shown by the plans, are spacious and conveniently arranged, and there is a cellar 7' 6" deep under the whole building.

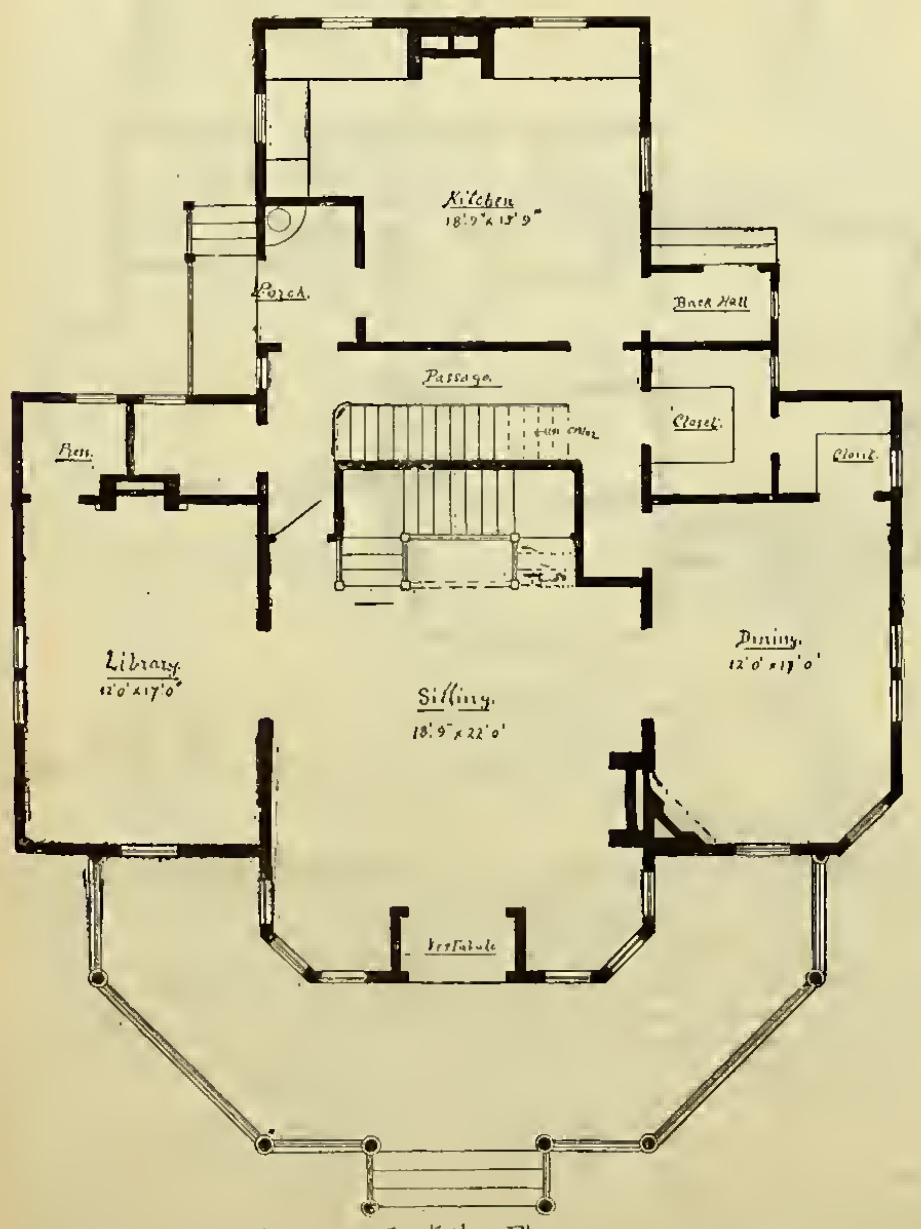
The foundation walls are of "Danvas" brick, laid in black mortar, and the chimneys and piers are carried up in the same way. The main roof is shingled with first quality Eastern shaved shingles. The corner boards are 6⅞", base ⅞", band ⅞", and boarding below band ⅞". The sizes of the main timbers are as follows: Sills and posts, 4"×6"; cross beams, 6"×8"; joists, 2"×8"; rafters, 2"×4" and 2"×8"; main rafters, 7"×2"; hip and valley rafters, 2"×8", and ridge, 1"×8".

The front staircase is executed in hard wood, and has a tread 1⅛" thick, risers ⅞", strings 1⅛", rail 2"×4", and posts 4"×4". The back staircase is of hard Southern pine. The dining room and library are finished in pine, and the sitting room in ash, with 5" bases, 7⅛" trim, and 2" moulding.

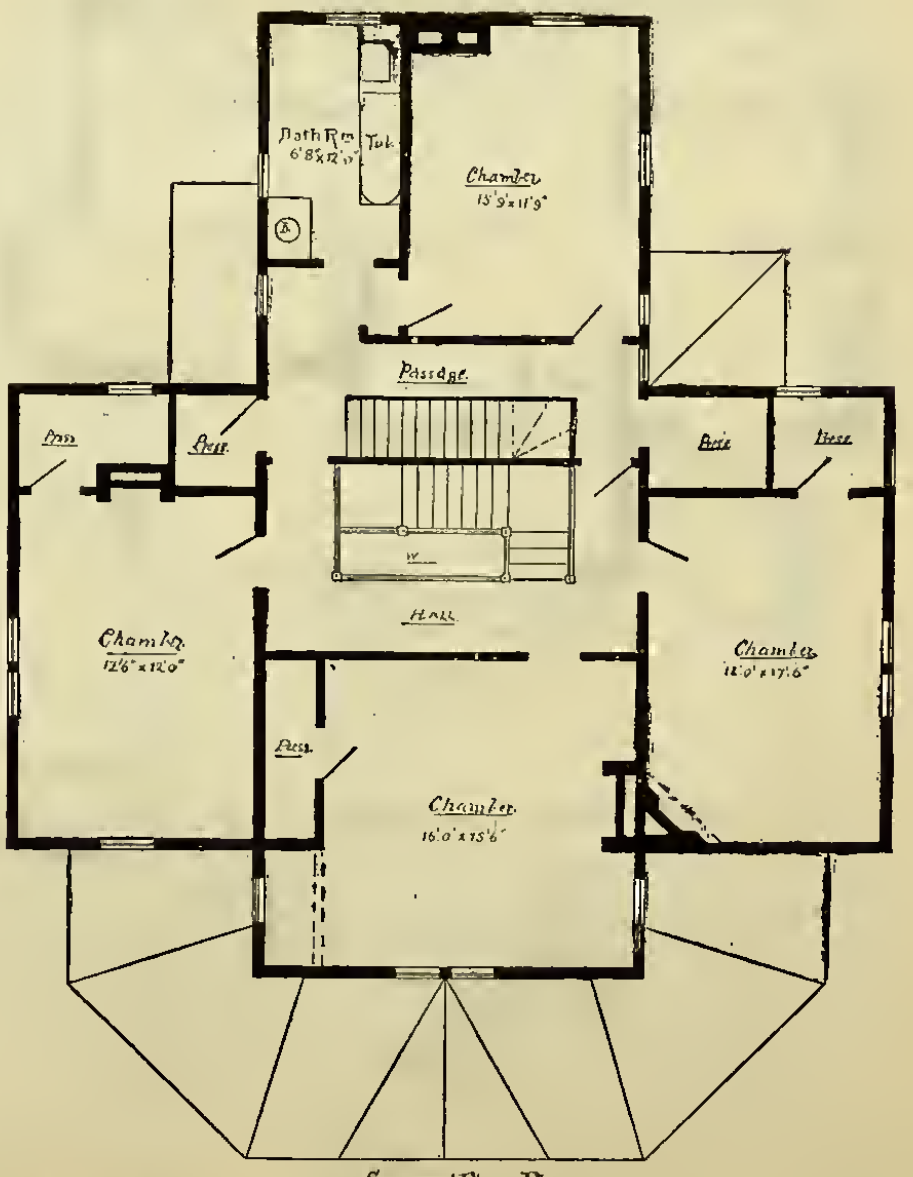
The water closet apparatus is the "Bartholomew," and the sinks the "Miller" variety. The exterior of the house is painted with Johns asbestos prepared paint, of the following tints: sides and gables, red; main building, light drab; weather boarding, dark drab.

ARCHITECTURAL plans and specifications for stores, dwellings, barns, schools, churches, and works of every kind are executed at the SCIENTIFIC AMERICAN office on very moderate terms. We can also furnish plans, details, and specifications for any of the buildings illustrated in this publication. Munn & Co., 361 Broadway, New York.





First Floor Plan.

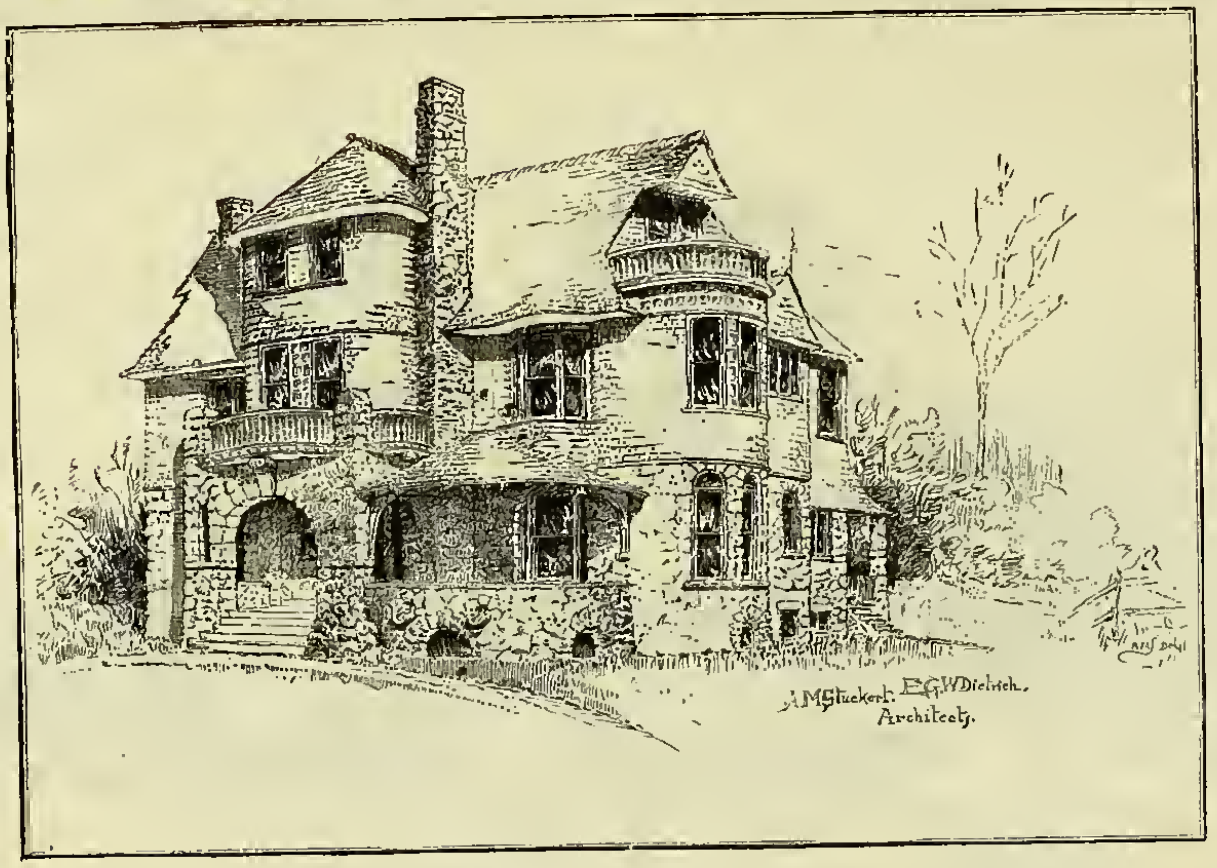


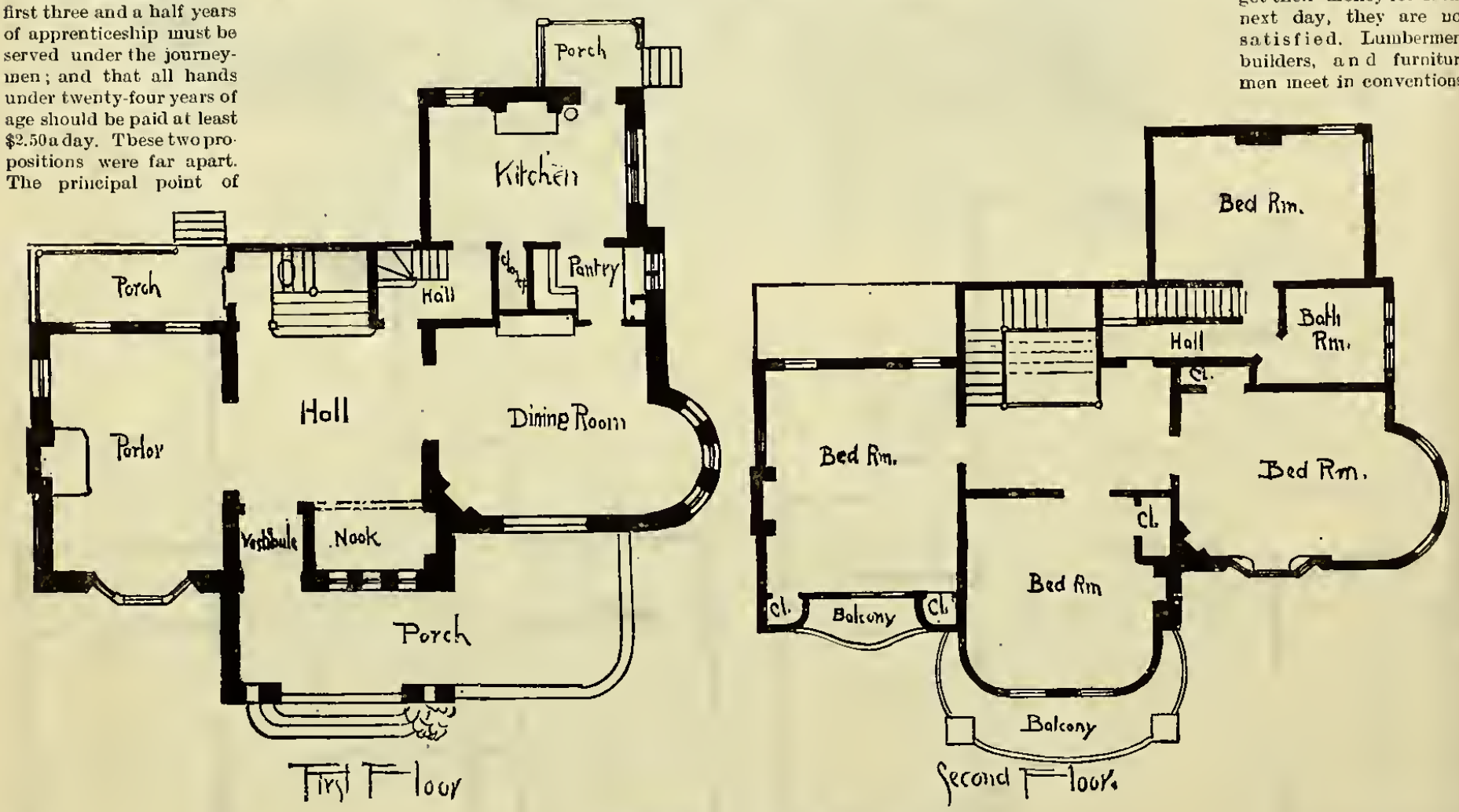
Second Floor Plan.

A DWELLING FOR THREE THOUSAND DOLLARS.

A RESIDENCE AT ORANGE, NEW JERSEY.

In a reeent number of the *Builder and Wood-Worker* we find an elevation and plans for a eomfortahle looking house, wbieh we herewith present. Messrs. Stuekert & Dietrieh, of this city, are the arehitects. The house bas a frontage of 48 feet. The principal dimensions are: Parlor, 14×19½ feet; dining room, 15×17; kitchen, 11×10; middle bed room, 15×15; left front bed room, 15½×18; right front hed room, 15×21; hack bed room, 12×17.





A RESIDENCE AT ORANGE, N. J.

Failure of the New York Plumbers' Strike.

The long strike of the journeymen plumbers of New York city has at last been declared off. The strike began September 1, 1886, and has been on since that time until reeently, when the contest, which for some time had been entirely one sided, was declared at an end. The eause of this strike was the deelsion of the master plumbers' association that apprentices must be at least 10 years of age; must read and write English; must understand the four eardinal rules of arithmetic; must serve five years; and must be under the sole control of the masters. The last provision was the one to which the journeymen most objeeted, but they refused to tolerate the masters' requirements. The journeymen then addressed a pronunciamento to the masters, in which they deelared that a master should take hut one apprentice for every four journeymen; that the selection of apprentices must be subject to tbe journeymen's association; that the first three and a half years of apprenticeship must be served under the journeymen; and that all hands under twenty-four years of age should be paid at least $2.50 a day. Tbese two propositions were far apart. The principal point of differenee was, however, the eontrol of the apprentices. All the other questions might have heen arbitrated, but on this important feature neither side would yield. The masters went into the fight determined not to yield their position, which was undeniably the right one. The masters have all through these dreary seven months been nobly earrying on the "battle for the boys," and have been growing stronger every day, both in material resources and in influence in the eity. The masters have secured the sympathy of all other trades in this fight, and respect for tbeir principles. Their assoeiation has been closer knit together than it was before, and, in the end, we helieve tbe benefits derived by the masters will more than balance the losses they sustained in the earlier part of the strike. The last portion of the strike has ineonvenieneed tbem but little. All members have had all the men they needed, and have attended to their business promptly, with hut one or two exceptions. They bave made gains in membership; they have established a healtby influence for other employers to follow; they bave indorsed the trade school system, and have made its instruction a part of the apprentices' term of indenture. These are direet gains. The journeymen have experienced nothing hut defeat ever since the beginning of the strike. They started in with the experience of previous strikes to guide them and with the promise of adequate financial support from the national assoeiation of journeymen plumhers. They made boasts ahout the co operative plan of carrying on business which they were successfully to estahlish, but which they did not. They have drawn on their working eomrades for $100,000, whieh has supported them in idleness. Tbey have sueceeded in driving off their most conservative and best meuhers into the formation of an independent journeymen's assoeiation. They have disrupted their original friendly relations with the gas-fitters, and made them enemies Tbey have sustained defeat on every point, and have now lost the figbt entirely. Could anything be more humiliating?—*Sanitary News.*

A GREAT marble deposit has been found in Inyo county, Cal. The marble is of superior quality, hard, solid, and free from flint. A test resulted in crushing an inch cube of the Inyo marble at 26,900 pounds.

Seasoned Lumber.

Lumber drying, as a rule, is slovenly and imperfectly done. It is the most neglected branch of the entire lumber business and its attendant industries. It is rare that inside finish, thoroughly seasoned, is seen. After a little the windows hecome so loose that tbey rattle, and the panels of tbe doors shrink to sueh an extent as to show unpainted streaks. In fine and expensive hardwood work more pains is taken. Wben it comes to furnitnre, not one manufacturer iu a hundred knows his business so far as seasoning lumber is concerned. They are as blind as bats to one of the most important elements of their business. Taking their output as a standard, it is doubtful if they know seasoned from unseasoned lumber. Provided tbey know one from the other, it is plain they don't care which they use. All this shoddy work by carpenters, contractors, and furniture makers might he avoided. It is siuply the result of haste, probably due in some cases to ignorance, in others to a laek of ample working capital, in others to a desire to make capital as remunerative as possible, and still in others to a don't care spirlt. That lumher ean be properly seasoned it would he foolish to question. In the absence of dry kilns it will so season if a roof be placed over it and it he exposed to the air long enough. Time is required hy this natural process, however, and that's where the rub is. House builders and furniture manufacturers want to save time. If they cannot buy lumber to-day, work it up to-morrow, and get their money for it the next day, they are not satisfied. Lumbermen, builders, and furniture men meet in conventions, and talk about nearly every other suhjeet nnder the sun that pertains to their interests exeept drying lumber. Never to our knowledge has this subject beeu up for discussion in one of these conventions. And so long as house and furniture buyers stand ready to pay them money for what they may safely bet ten to one is an imperfect article, the subjeet probably never will eome up.—*N. W. Lumberman.*

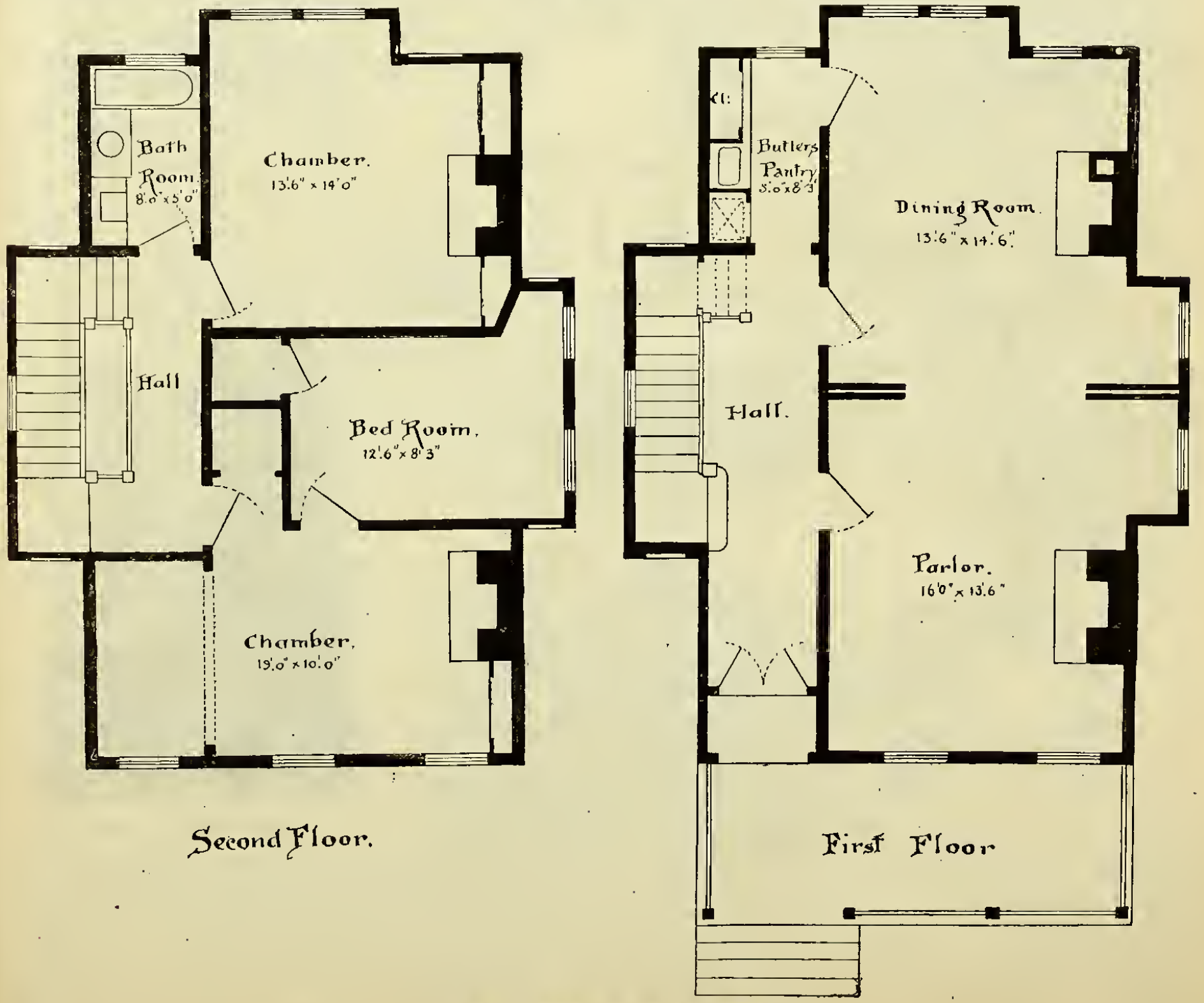
We should be pleased to have our readers bear in mind the fact that full plans and specifications for any of the huildings illustrated in this paper may be obtained at this office on moderate terms. We are assisted hy able architects, and can execute any work desired on very moderate terms. Munn & Co., 361 Broadway, New York.

A THREE THOUSAND DOLLAR HOUSE.

This attractive and conveniently arranged little residence was lately erected on Fleetwood Avenue, near Popham Street, Mount Hope, New York, for Mr. A. MacIntosh, Jr., from the designs of Architect John E. Kerby, of 280 Broadway, New York city. In the basement is a kitchen measuring 14'×16', fitted with wash tubs, sink, and range, besides coal and other cellars and furnace room. In the attic are three good-sized bed rooms and large hall.

The foundation of the house is stone; the frame is clapboarded up to level of top of first floor and shingled above, and the chimneys are carried up in brick. The interior trim is natural cherry wood on the first floor and pine on the others. Gas, heat, and all other necessary improvements have been provided.

The house cost the sum of $3,500 to build, but with a little plainer material it could be easily erected for $3,000.



A THREE THOUSAND DOLLAR HOUSE.

A Building Union in Chicago.

At a recent conference of delegates from every building interest in Chicago, with representatives present from the Illinois Architects' Association, the Chicago Real Estate Board, and kindred bodies, the members of which hire altogether probably 50,000 workmen, a resolution was unanimously adopted that from this time forth the signature by the employe to the following card of principles be made a universal condition of employment by all the building interests of Chicago:

"I recognize the right of every man to decide for himself without dictation or interference when he shall work or cease to work, where he shall work, for whom he shall work, how many hours he shall work, and for what wages he shall work.

"I recognize the absolute right of the employer to decide for himself, without interference from any source, whom he shall employ or cease to employ, to regulate and manage his business with perfect independence and freedom, provided only that he shall deal lawfully, justly, and honorably with all men.

"I recognize the right of every father to have his son taught, and of every son to learn any lawful trade, as on a plane with his right to a knowledge of reading, writing, or any other branch of learning, and that this right should be subject to regulation only by the laws of the land. I hereby pledge myself in all my relations and intercourse with my employers and fellow-workmen to maintain and live up to these principles."

There was no debate on the adoption of this measure, and action was enthusiastically unanimous, but a general discussion sprang up when it was proposed that the same card of principles be presented for signature to every employer with the pledge thereto changed as follows:

"I hereby pledge myself to maintain and live up to these principles in the prosecution of my business, and to lend my aid to the full extent of my influence and power for their maintenance and protection among my fellow employers. I further pledge myself not to employ any workman except upon his signature of this card of principles."

When it was stated that the pledge meant the discharge of every workman who did not sign the required card, numerous objections were raised, especially by contracting plasterers, carpenters, and stone cutters, who are getting along peaceably with their men and are expecting no trouble. All objections were met with the reply that the card contained nothing not guaranteed by the Constitution of the United States, and that the country had got tired of being shackled by the labor unions.

At length a tacit understanding was reached that the pledge should be voted upon by the delegates individually, they then to go to their associations and urge its ratification. The pledge was thereupon adopted unanimously. June 1 was fixed as the date when the lockout would be declared off and business resumed with the card of principles as the basis.

MONTANA produced in 1886 55,000,000 lb. of copper.

STABILITY OF WALLS AT OPENINGS.

The following article has been written by M. Emile Trelat, architect in chief for the department of the Seine, director of the especial School of Architecture, and has appeared in *Le Genie Civil*. It contains matter of some interest, although some of the defects of which the writer complains do not obtain with English work, as English methods are not always those to which objection is taken.

Fig. 1 shows the manner in which openings in the walls are generally constructed. It will be seen that

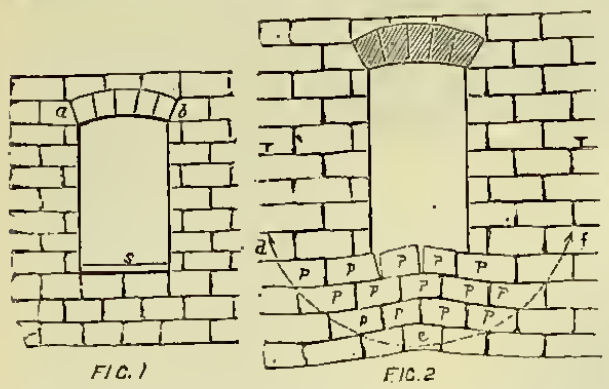
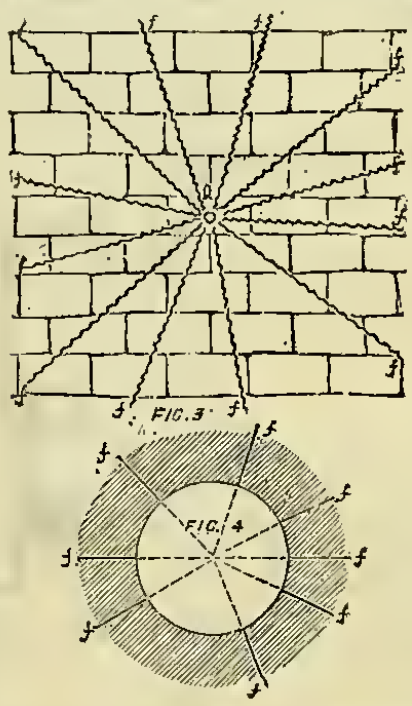
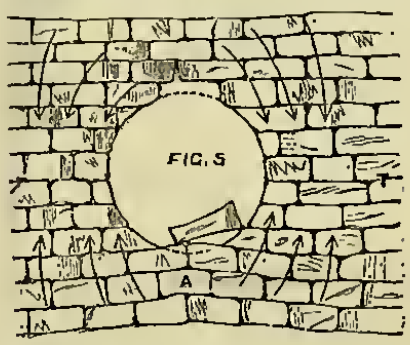


FIG. 1 FIG. 2

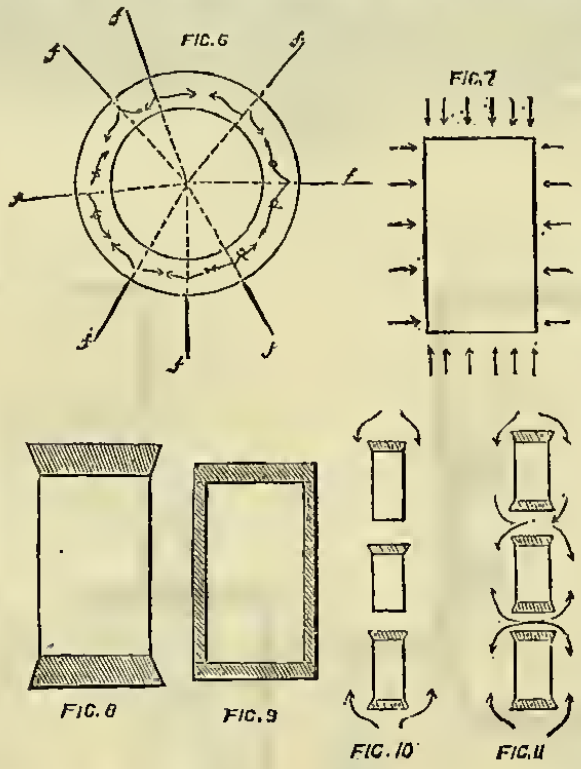
the courses are simply discontinued at the place where the opening is required, except at the top, where an especial support is added, capable of sustaining the weight which surmounts the bay. This has been the method always pursued, and it is singular that its imperfections have not been recognized. On looking at a nearly finished new building, it may be observed that the stones of the masonry below the bays are displaced and raised up. This deformation gradually develops as the work proceeds. When the edifice is built of hewn stone, the displacement is scarcely perceptible, especially if the blocks are large; but if smaller



materials are used, it becomes very considerable. Beyond a certain point the disorder ceases to progress, because under the upheaved layers, Fig. 2, the stones press against each other in one direction, *def*, forming an inverted arch, and the foundations from whence at first arose the dislocation of the stones, *ppp*, bring a resisting force to bear upon the piers, TT. It is on account of these disorders, limited, though not avoided, that the following rule is to be found in all treatises: "The supports and sills of the bays should never be fastened into the masonry of the jambs, and should not be placed until the sinkings have ceased." Economy



requires that the sills, Fig. 1, should be reduced in thickness, which if they were fixed at their extremities would render them liable to break when what is shown at Fig. 2 occurs. Experience shows, therefore, that it is best simply to place the supports and sills between the jambs. Why should not these displacements be avoided by some appliance fixed under the bays? The question is better understood when treated mechanically. Fig. 3 shows a well made wall composed of resistant materials. It is stable and solid, because round any point, *o*, all the forces, *fff*, are equal and opposite, balanced in *o*. If the field of resistance immediately round were partially removed, the displacement of materials would follow until the forces were again balanced by new conditions set up under a new form. For instance, in Fig. 4, the forces, *fff*, or those derived from them, would continue to act on the remaining part of the wall, but the material road by which they joined the meeting point being removed, their direct reactions would be interrupted. Two results may then follow—the materials which border the hole, not being fitted to maintain the place from which the forces, *fff*, tend to remove them, are dislocated, compressed on one side, separated on the other side as in Fig. 5, so that the material path of the direct reaction of the forces becomes in a way reconstituted; but the work is then ruined, as seen by Fig. 5, by the sinking of the piers, TT, which causes the lower stones to rise and the upper ones to sink toward the aperture. The arrows show the direction taken by the derivative forces to accommodate and balance themselves in the new arrangement of the materials unless the opening is bordered by a frame of a material sufficiently resistent to preserve its form and to set up an opposition to the course of the forces, *fff*, etc., as in Fig. 6. If instead of a circular hole, the bay be rectangular, as is generally the case in edifices, Fig. 7, it will be remarked that the forces, *fff*, are all vertical and horizontal, and that the actions and reactions of those that are horizontal are so slight and accidental that it is scarcely necessary to provide against them, while those which act vertically are considerable. Under such circumstances, strength should be exclusively given at the top and the bottom of the bay, Figs. 8 and 9. In summing up these remarks the author insists that every bay should be well protected at the bottom as well as at the top, enabling the jambs to sustain and distribute the vertical changes in pressure and its line of action. He concludes by point-



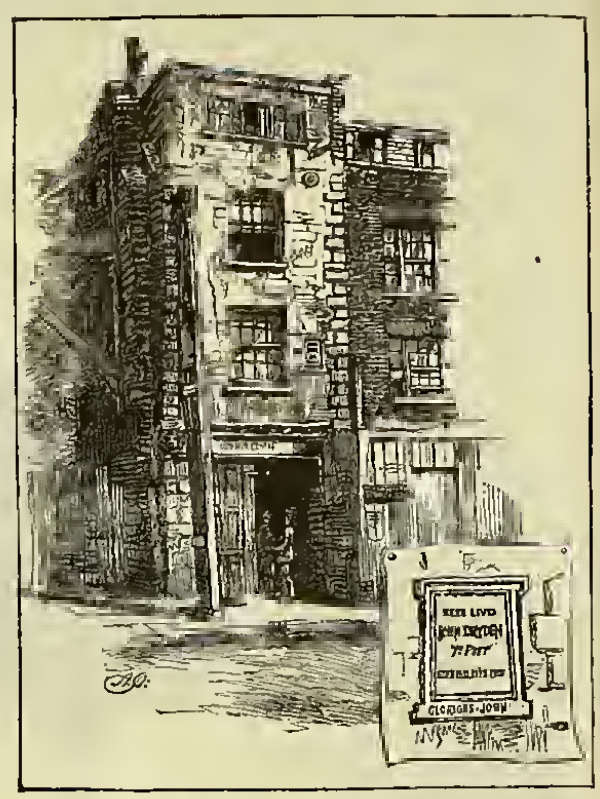
ing out the greater advantages of iron frames for stability and capacity to maintaining the form of the bay. In many storied edifices where the bays are above one another, it may be thought sufficient to strongly sill the bottom of the lowest bay only, as in Fig. 10. But it is far better to do so to the upper and lower parts of every bay, as all materials can thus be better adjusted, and the regularity of the lines maintained.—*The Engineer.*

An Ancient Theater.

To our mind, the most interesting relic of old Syracuse is the Greek theater. This, like the quarries, the catacombs, and the amphitheater, has been cut out of the rock, so that, considering its antiquity, it is in a very much better state of preservation than buildings of a similar character which have been "put together." It was built about 500 years before Christ, and consists of forty-two rows of seats, divided by two corridors, most of which are in excellent preservation. A long pit extends from wing to wing across the semicircular space at the foot of the seats, and this may have been a receptacle for the curtain. Beyond this, confused masses of stone mark the area of the stage proper, from which steps still lead to the cliff above. The view from the theater on a bright, sunny day is a scene not easily forgotten by the spectator, and is only surpassed in Sicily by the view obtained from the theater at Taormina. The eye wanders over the glimmering stonework, across a fertile tract of orchard land, to the deep blue waters of the Greater Port, one of the most magnificent natural harbors in Europe, and beyond this again to the low swampy shore of the peninsula of Plemmyrium, now known as Isola, and famous for the wine of that name. Not a sound breaks upon the ear as we sit here and sentimentalize. Despite the bright scene, we feel that we are in a land of the dead, and find it hard to realize that all around rose a city called by Cicero "largest of Greek cities, and most beautiful"—that the unbroken surface of the blue waters stretching away before us was once alive with the navy of a great nation and the argosies of every commercial state in the ancient world. The lizards dart about the sunlit stones, birds flutter in and out of the ancient vestibules and retiring rooms, but we are alone, and are thankful for it.—*London Society.*

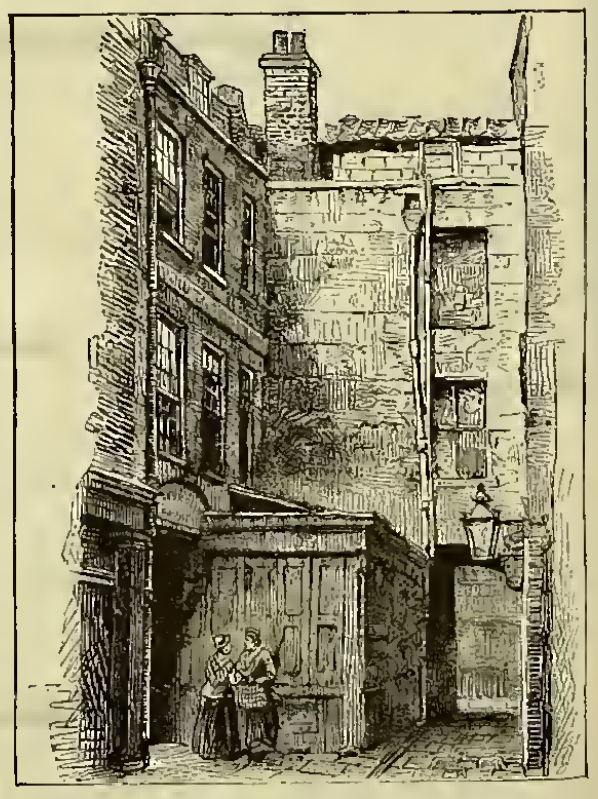
THE HOUSE OF JOHN DRYDEN.

The demolition of an old house in Fetter Lane, upon which the inscribed tablet bears witness that it was



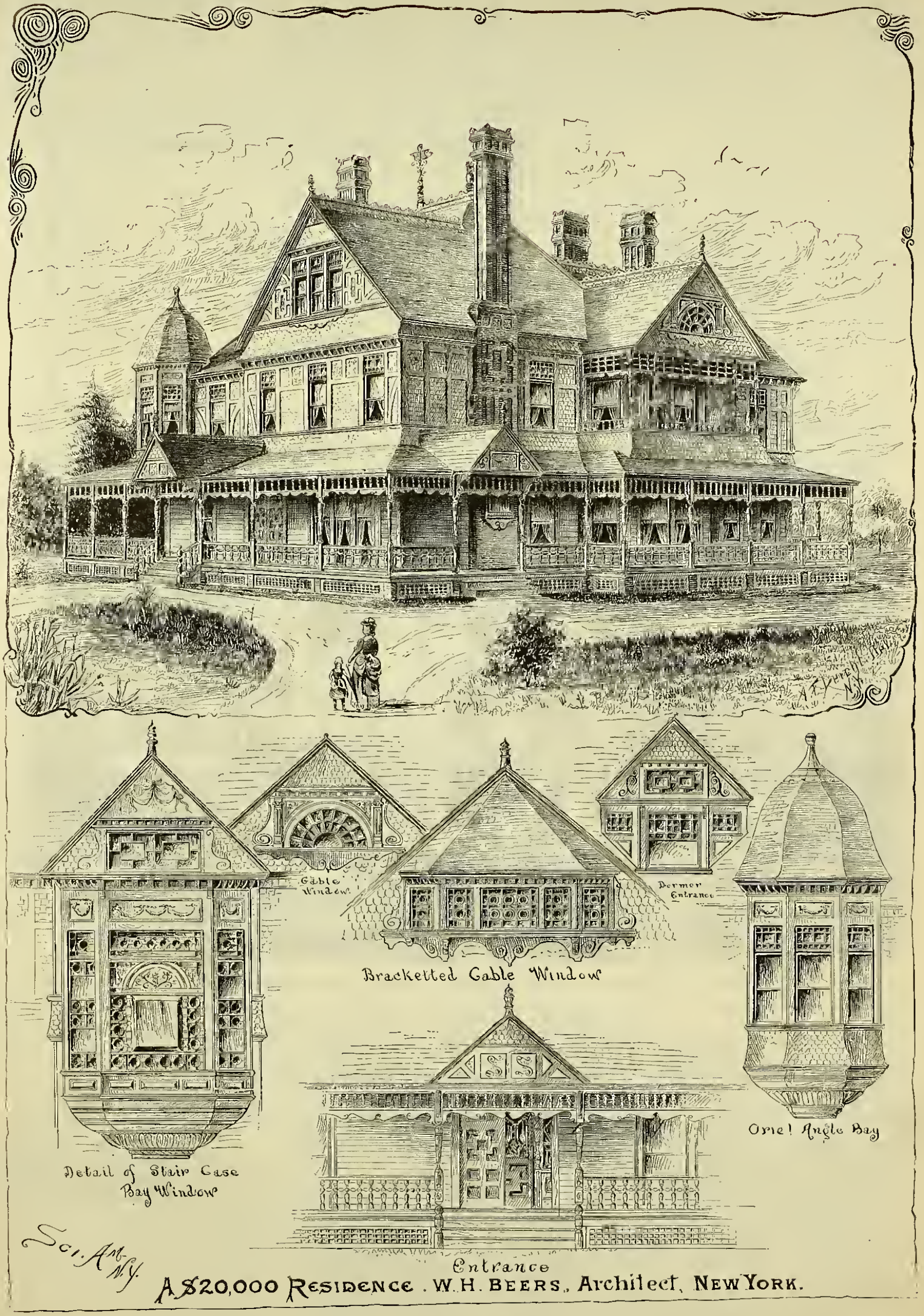
THE HOUSE OF JOHN DRYDEN, IN FETTER LANE.

once the residence of Dryden, removes one of the few remaining antiquarian relics of a period, nearly two centuries ago, when most of the "men of wit about town," especially the professional authors, inhabited the narrow streets and courts north of Temple Bar and the upper part of Fleet Street. Dryden and Otway, rival dramatists but friendly companions, lived directly opposite each other in Fetter Lane. Otway called one morning at breakfast time, and was told that Dryden was out—that he had gone to breakfast with the Earl of Pembroke. The poet of "Venice Preserved" said he would call again; he did so, and was informed that Dryden was gone to see the Duke of Buckingham. A little disappointed, but not mortified with jealousy, Otway took a piece of chalk that lay on the table, stepped outside the front door, and wrote



BACK OF DRYDEN'S HOUSE, IN FETTER LANE.

upon it, what was true and kindly meant, "Here lives Dryden, a poet and a wit." Presently, Dryden came home, saw the writing, took the chalk, and added a second line, "This was written by Otway, *opposite*." It was certainly a rude piece of verse, for such a masterly hand; but we do not like to believe that Otway took offense at the joke, as intended to signify that *he* was the opposite to a poet and wit. Dryden's publisher, Jacob Tonson, had a shop near the Inner Temple gate.—*Illustrated London News.*



A $20,000 RESIDENCE . W. H. BEERS, Architect, NEW YORK.

[For description see page 134.]

HEATHCOURT, MAIDENHEAD.

Our illustration represents a house recently erected for Mr. Arthur Lawrence at one of the most attractive spots near London, bordering on the well known Maidenhead Thicket, and adjoining the old London and Bath high roads. The ground is high, about 1½ miles from the railway station, and in a locality rapidly and deservedly becoming very popular. The building has been constructed in red brick with Doulting stone dressings and Broseley tiles. Mr. Arthur Vernon, of 26 Great George Street, Westminster, is the architect. —*Building News.*

A SUBURBAN RESIDENCE.

We publish an admirably planned and picturesque design of a suburban residence, by Mr. Wm. H. Beers, architect, New York. The house has been designed to occupy a corner lot, with a frontage of one hundred feet on the main street and two hundred on the side street, giving ample room for a stable in the rear of the lot. The house has an extreme frontage of 55 feet by 65 feet in depth. All the principal rooms on the first and second floors have an outlook on the main street; and while the dining room is in the rear of the library, a view of the main street is possible, as here has been thrown out an octagonal projection, producing a very pretty effect, both as to exterior and interior. This projection is carried up two stories, giving the same advantage to the chamber over dining room, with the addition of a second story piazza off this room.

The exterior of the house on first story is finished with clapboards and trimmed with corner boards, belt courses, etc , as shown on the drawing, and over each window is placed a swinging transom glazed with stained glass. These transoms are very pretty in their interior effect, and also furnish an excellent means for ventilation, when opened, in connection with the open fireplaces in each room. The second story is carried out in the "Old English" half-timbered style, with the panels filled in with round cut shingles. On the front there is a gable extending half the width of the house, with a very effective group of windows in same. The panels in this gable are filled with shingles, carved woodwork, rope twisted in artistic designs, secured to the wood, and finished in bronze, producing an excellent effect.

The two most beautiful and striking effects produced are the bay windows—at corner of house on second story, and the bay which forms the staircase landing. These two superbly designed windows are equally effective in their interior effects. The chimneys are tall, and are quite an architectural feature in themselves, and in the library chimney there is a window over mantel shelf filled with an artistic piece of stained glass work. On all sides of the building there is some interesting architectural feature or bit of detail that pleases the eye. Passing up the front steps on to the piazza, which runs across the front and side of the building, you enter the house through a large vestibule, finished in "old English oak," highly polished, with vestibule door and side filled with beveled plate glass, entering a wide hall, finished in "quartered oak," with wainscoting five feet high, and panels of wainscot filled in with relief work, finished in old silver. A hat rack with large mirror, built in, and forming part of the wainscot, is placed beyond the parlor doors. In the rear of the hall, facing the front entrance doors, is a large and massive oak mantel, with tile hearth and facings; frame and andirons finished in old silver.

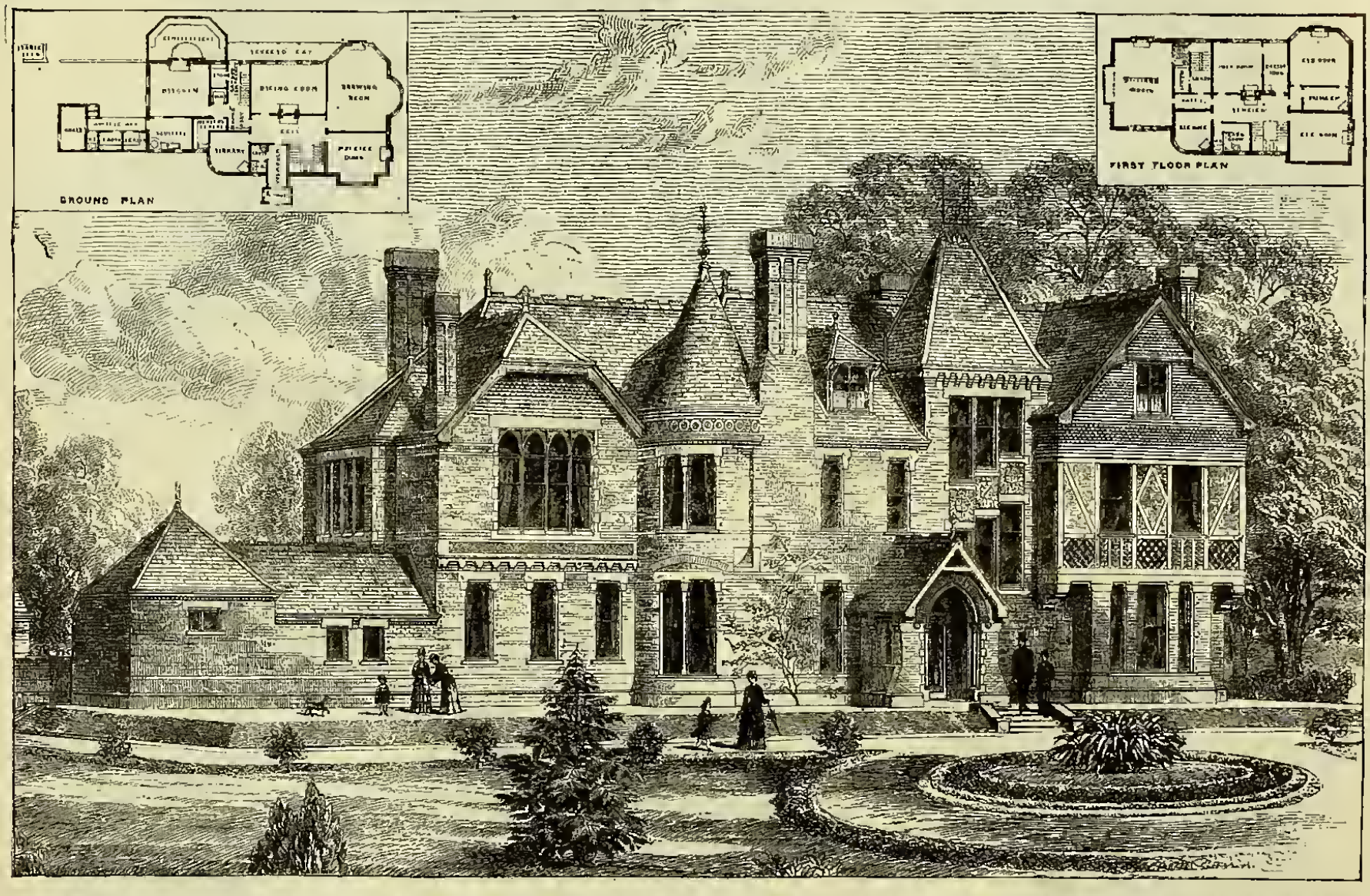
The principal feature in the house is the staircase at the right of the mantel. This staircase, occupying as it does the full width of the staircase hall, is built in quartered oak. The first flight of steps are six feet wide, flanked on the right by a massive carved newel, with a "dragon" holding a newel light finished in old silver. After ascending the six steps you reach a broad gallery, running the full width of the hall, with rail, newel, and an open screen, with carved posts, spindles, etc., dividing gallery from the hall proper. With a rug on the floor, and a few tropical plants placed about, this makes an effective and desirable resting place. Ascending a short flight of six steps, you reach the second gallery or bay window landing, with upholstered seats about windows in bay. This beautiful window produces a truly magnificent effect, with its fine stained glass, reflecting its various colors in the hall below. From this landing, by ascending six steps more, you arrive at the level of the second story. On the right of the entrance hall you enter the library through large sliding door opening, and find this room finished in dark antique mahogany, finished with a high polish, and a large, massive mantel running to ceiling. In front of room there are a charming group of three windows with their broad panes of plate glass looking out on the main street. At the opposite end of this room, on each side of the large sliding door opening, leading to dining room, are low bookcases with silk curtains hanging from brass rods. The remaining wall space in this room is reserved for furniture.

Passing from the library into the dining room, you find a large, spacious room with a large mantel, in English oak, facing you as you enter from library, while at the end of the room an octagonal bay has been thrown out to give a view of the main street. With its broad sheets of plate glass, the stained glass above gives this room a very cheerful effect. The buffet and mantel are in one, the buffet extended on each side of the chimney, which as designed produces a novel and pretty effect. All the wood in this room is "old English oak," finished to a dull gloss.

Passing from this massive room, we enter the drawing room, which is finished in white maple, with elaborately carved mantel and trim. This room is carpeted with carpet in the most delicate colors, while the side walls and ceiling are decorated in delicate shades of cream, pink, and gold. All the rooms, except drawing room, have parquet floors. The kitchen, laundry, pantries, etc., are as perfect in their arrangement and details as could be desired, and as a study of the plans will reveal.

On the second floor all the chambers are light and cheerful, and have a pleasant outlook, and are finished in white maple, cherry in its natural color, and white ash, all rubbed down and brought to a high polish. The bath room is finished in white maple, with cream white tile dado, four feet high, and tiled floor. Some of the bed rooms have dressing rooms adjoining, and each chamber has from one to two large closets fitted up with shelves and drawers.

In the attic there are a number of servants' rooms, trunk rooms, packing room, etc., all fitted up complete in every detail. The cellar is large, open, and light, with a large hot air furnace which heats the whole house perfectly. There is also a large storage refrigerator, inclosed with brick walls, and built in a most perfect manner. The cost is estimated at about twenty thousand dollars.



RESIDENCE OF MR. ARTHUR LAWRENCE, MAIDENHEAD THICKET, BERKS, NEAR LONDON.—ARTHUR VERNON, ARCHITECT.

Egyptian Reliefs.

The wall was first chiseled as smooth as possible, the imperfections of the stone were filled up with cement or plaster, and the whole was rubbed smooth and covered with a colored wash. Lines were then ruled perpendicularly and horizontally with red color, forming squares all over the wall, corresponding with the proportions of the figures to be drawn upon it. The subjects of the painting and of the hieroglyphics were then drawn on the wall with a red line, most probably by the priest or chief scribe, or by some inferior artist, from a document divided into similar squares. Then came the chief artist, who went over every figure and hieroglyphic with a black line and a firm and steady hand, giving expression to each curve, deviating here and confirming there the former red line. The line then traced was then followed by the sculptor. In this stage there are instances of a foot or head having been completely sculptured, while the rest of the figure remains in outline. The next process was to paint the figure in the prescribed colors, and in some cases the painted line deviates from the sculptured line, showing that the painter was the more important workman, and that even in this last process no possible improvement was omitted. There are other instances where a considerable deviation from the position of a leg or arm has been made after the sculpture was finished and painted; the part was recarved and the defective portion filled in with plaster, which, having since fallen out, furnishes us with this curious evidence of their practice.—*Owen Jones.*

FLOORS AND CEILINGS: ANCIENT AND MODERN.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

(*Continued from page* 117.)

III.—JAPAN—THE MODERN HOUSE.

According to Fauld, however humble a Japanese home, it is always guarded by a moat. In a feudal mansion the moat was usually deep enough to prove a genuine obstacle. We should call the modern moat a gutter. While it is still almost universally retained, the muddy water is hid in the summer time by duckweed or the broad leaves of the lotus. Even in front of the humblest dwellings is the inevitable miniature moat, which is often dry, of a foot or so in breadth, and at most about two inches deep. These moats or gutters are lined with stone in receding layers, in the better class of dwellings. The humble habitations have their moats lined hy thin pine hoards pegged down into the ground. As their sides and bottoms are of course open to absorb the drainage, and as all the surface sewage passes into them, the sanitary results are sometimes disastrous.

Approaching the gate, we are awed hy a massive arrangement of hlack wood. Its form, in some cases, approaches that of the so-called "bird rest" in front of Japanese temples. The wall or fence may consist of bamboos, whole or split, or of thin wooden planks blackened with a mixture of India ink and the juice of the unripe persimmon, which is highly hitter, astringent, and antiseptic, preserving the wood for a long time.

In the houses of some pretensions there is an embankment behind the moat, topped hy a quick-set hedge of either holly, privet, camellia, or the like. Behind this there is either the fence already described or a wall composed of thin tiles laid horizontally, with much white shell lime; or a hamhoo lath and plaster wall, sometimes covered by diamond shape tiles, the joining lines of which are concealed by diagonals of white lime laid on smoothly, rounded, and as thick as three fingers. This has a pleasing appearance, quite characteristic of Japanese architecture. As the name of the street is not to be fonnd at the street corners, it is repeated at every doorway. The towns are divided into wards and blocks, and the numbers of the houses are often confused and misleading.

A slip of whitewood is nailed on one of the posts of the gate and is inscribed with the name of the street or block, the numher, name of householder, numhers and sexes of household. Besides this combined street sign and door plate there is often a charm to keep away the wolf from the door, an animal which was literally once known in the vicinity of Tokio, and greatly dreaded. Within the porch there are racks for halberts and other grotesque instruments of formidable shapes. These accouterments have been removed, but the racks still remain, the traditional sign post of an obsolete custom. The gates of the larger houses are heavy, and are adorned with copper or bronze mountings, and often studded with large nails.

Upon entering the gate you fiud a court, from the several sides of which the open verandas of the huilding may he approached, Entrance to the high verandas is effected by means of heavy wooden stairs. The court is sometimes paved with water-worn stones, larger than a goose egg. Sometimes it is level, weedless, perfectly well swept earth, and in either case lines of smooth stepping stones are placed in the regular pathways.

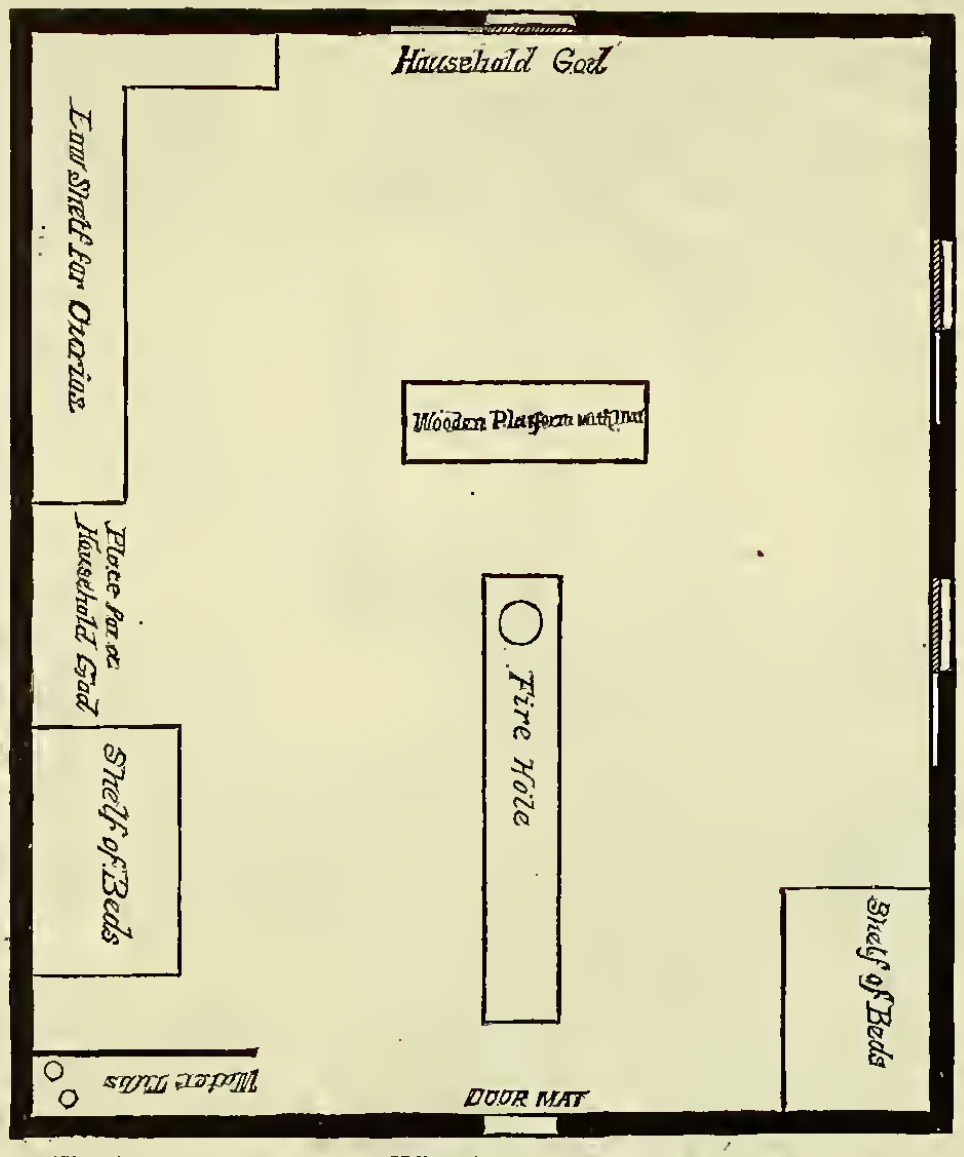


Fig. 1.—INTERIOR ARRANGEMENT OF AN AINO DWELLING.

Fig. 2.—AINO HOUSE YEZO.

The gardens, even of somewhat humble mansions, are often graced with carved stone lanterns. The roof is of hlack tiles in Tokio, and the darkness of the clay from which they are made is due to the presence of organic matter. In the poorer houses, wooden shingles are sometimes used.

In front of the doorway is a small space unfloored, called the *doma*, where you take off your shoes after announcing yourself in the words, "O tonomi mosu" ("I beseech you") or by ringing a gong suspended from the door post. The heams supporting the roof are ponderous. The walls are hung with paper lanterns, and there is a range of white wooden fire huckets, all stamped with the crest of the owner. Some of the lanterns are cylindrical, and open out like a concertina. They are suspended from a hooked stick, and are similar to those that were used in ancient Egypt. In one part of the house, according to Mr. Fauld, is the altar shelf, on which images of saints or sages or pictures of ancestors may be seen, with incense tapers hurning before them by day and lamps at night. Photographs of the dead are often honored in this way. In drawing Fig. 1 we show the interior arrangement of an Aino dwelling, in which the position of the altar shelf is indicated by a diagram. It is sometimes called the ancestral shelf.

Fig. 4.—A MODERN JAPANESE HOME.

In the walls are recesses with sliding doors, into which the bedding is thrust in the day time. Clothes are kept in plaited bamboo boxes, usually covered with black or dark green water proof paper. The furniture is very simple. There are often in the best houses no chairs, no stools, no tables, no bedsteads. There may be some low short-legged side tables of characteristic Japanese pattern and one or two costly vases or other ornaments, a few scroll pictures, which are changed in deference to guests and seasons, some flowers or dwarf trees in vases and a lamp or two. In summer a well planned Japanese house is the very ideal of coolness, grace, and comfort. In winter it is the realized dream of misery. Fire places are unknown, and the ventilation is conspicuous by its absence. The walls within are wainscoted and hung with painted and variously colored paper. Mr. Hildreth, the historian, suggests the probability of the derivation of paper hangings as a suhstitute for tapestry from this circumstance. To every house is attached a back yard, which, though never so small, yet always contains some curious and beautiful plants, and they are attended to with a great deal of care. In Fig. 2 is shown an Aino house, by permission of Prof. Morse and his publishers, Messrs. Ticknor & Co. In Fig. 4 the street view of modern house in Tokio, and in Fig. 5 the framing plan of an ordinary two storied house, a description of which we take from "Japanese Homes and their Surroundings." The Japanese standard of measurement is a *sun*, which is nearly equal to our *foot*, and is divided

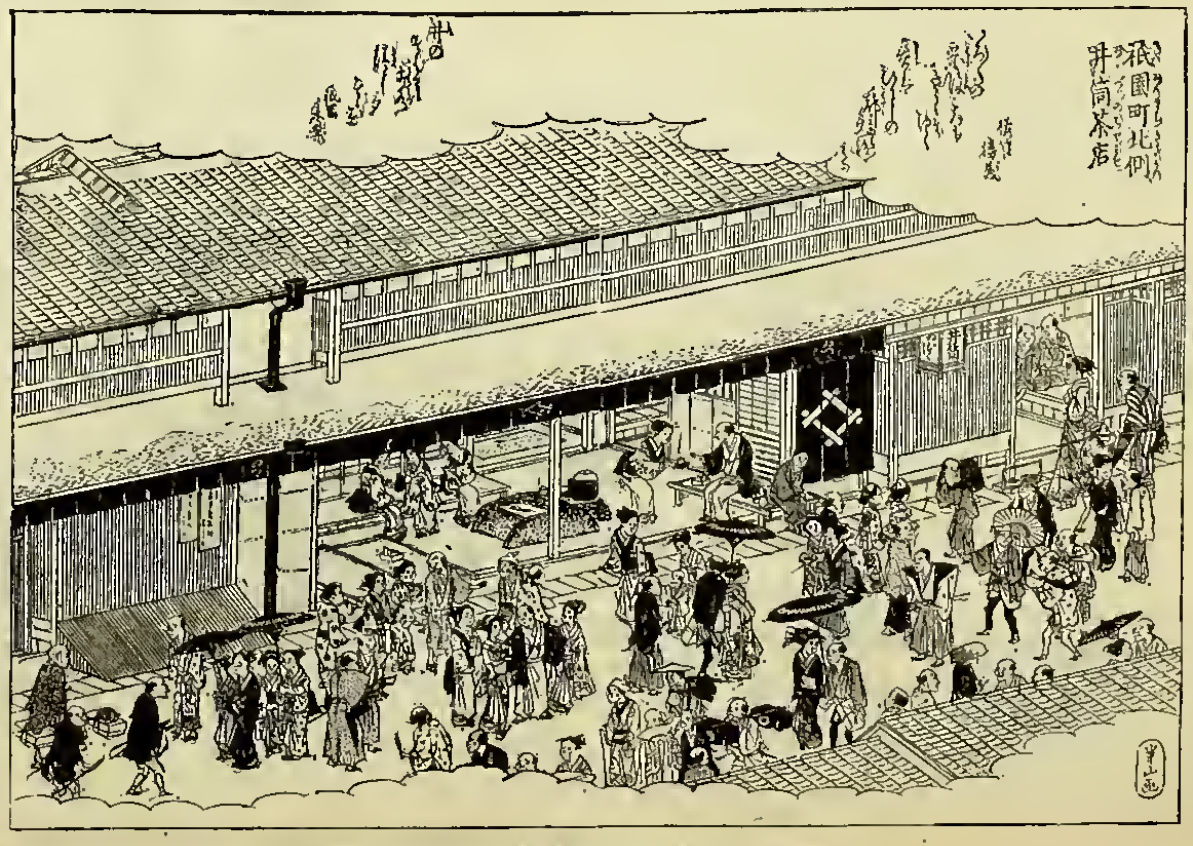


Fig. 3.—A STREET SCENE IN KIOTO.

into tenths. The wood employed in the frame is usually cedar or pine. The corner posts, as well as the other large upright supports, called *has hira* (H), are square, and five tenths of a foot in thickness; these are tenoned into the plate upon which they rest. This plate is shown at D. It is made of cedar and sometimes of chestnut. Its cross section is six tenths of a foot square, and rests directly on a number of stones, F. Between the principal uprights smaller uprights or studding are placed as indicated at B, and the cross section is two tenths of a foot square. Through these pass the cross pieces called *nuki* (see A). They are four tenths of a foot wide and one tenth of a foot thick. To these are fastened bamboo slats, the substitute for laths. The horizontal beam to support the joists of the second story floor is called the *nikai bari* (shown at C). This is of pine, with a vertical depth of one and two tenths feet, and a width of six tenths of a foot. The rafters of the roof, called *yane shita* (see I), in this frame are nine feet long, three tenths of a foot wide, and eight tenths of a foot in depth, thus showing that they recognize the engineering axiom that with any given cross sectional area the deepest beam is the strongest, if prevented from lateral motion. Cross beams (see J) from the upper plate are called *taru ki*. From them spring short posts to support the ridge pole. The first floor is sustained by posts that rest on stones embedded in the ground, as well as by a beam called *yuka shita* (E). This is secured to the upright beams at the height of one and one half or two feet above the lower plates. The upper floor joists are of pine, two inches square. The flooring boards are six tenths of a foot in thickness and one foot wide. The lower floor joists, called *neda maruta* (G), are rough round sticks, three feet in diameter, hewn on opposite sides. On top of these rest pine boards six tenths of a foot in thickness.

In Fig. 3 we show a street scene in Kioto, one of the most beautiful cities of the Japanese empire. Japan is a land of littles. Their most beautiful objects are generally little. The knob of a stick or the button of a tobacco pouch is often an art work of the highest elaboration, and their dainty foods are served in small portions. It is also a land of earthquakes, and this brings us to one of the most singular facts connected with the structure of Japanese buildings—a method adopted with the special view of insuring safety during these periods of the earth's vibrations. Japanese houses and temples are put together in a solid and simple manner, each work being complete in itself, and having an altogether independent existence. Thus, a Japanese house is in no way built upon foundations, or fixed to the ground on which it rests. It stands upon a series of legs, and these legs usually rest on round-topped stones of such a height as will during the rainy season support the timber uprights above any water that may lie upon the ground. In Fig. 5, showing the framing of an ordinary dwelling, which we have taken by permission from Prof. Morse's "Japanese Homes and their Surroundings," this arrangement of short posts upon foundation stones is very well shown.

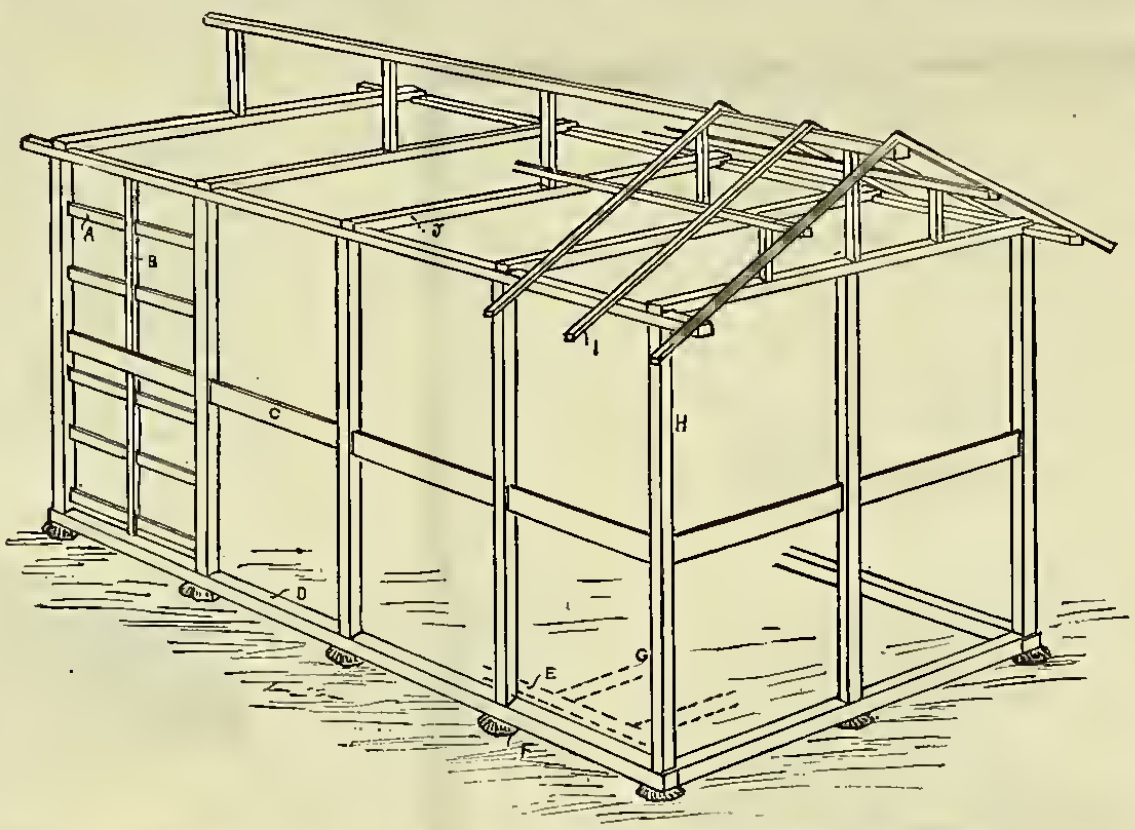


Fig. 5.—FRAMING OF AN ORDINARY TWO STORIED HOUSE.

It is obvious that while an object fixed to the earth might if rocked be broken off from the ground, or become strained and destroyed, that which is loose would simply oscillate and settle down again after the vibration had ceased, whereas, if the posts were fixed, the application of a small amount of pressure on the upper part (especially if the top was heavy), or any upheaving of a portion of the ground on which it rests, would be likely to do it an injury or effect its destruction.

Pagodas are often of great height, yet many have existed for seven hundred years, and have withstood successfully the many vibrations of the ground, which must have inevitably achieved their overthrow had they been erections of stone or brick.

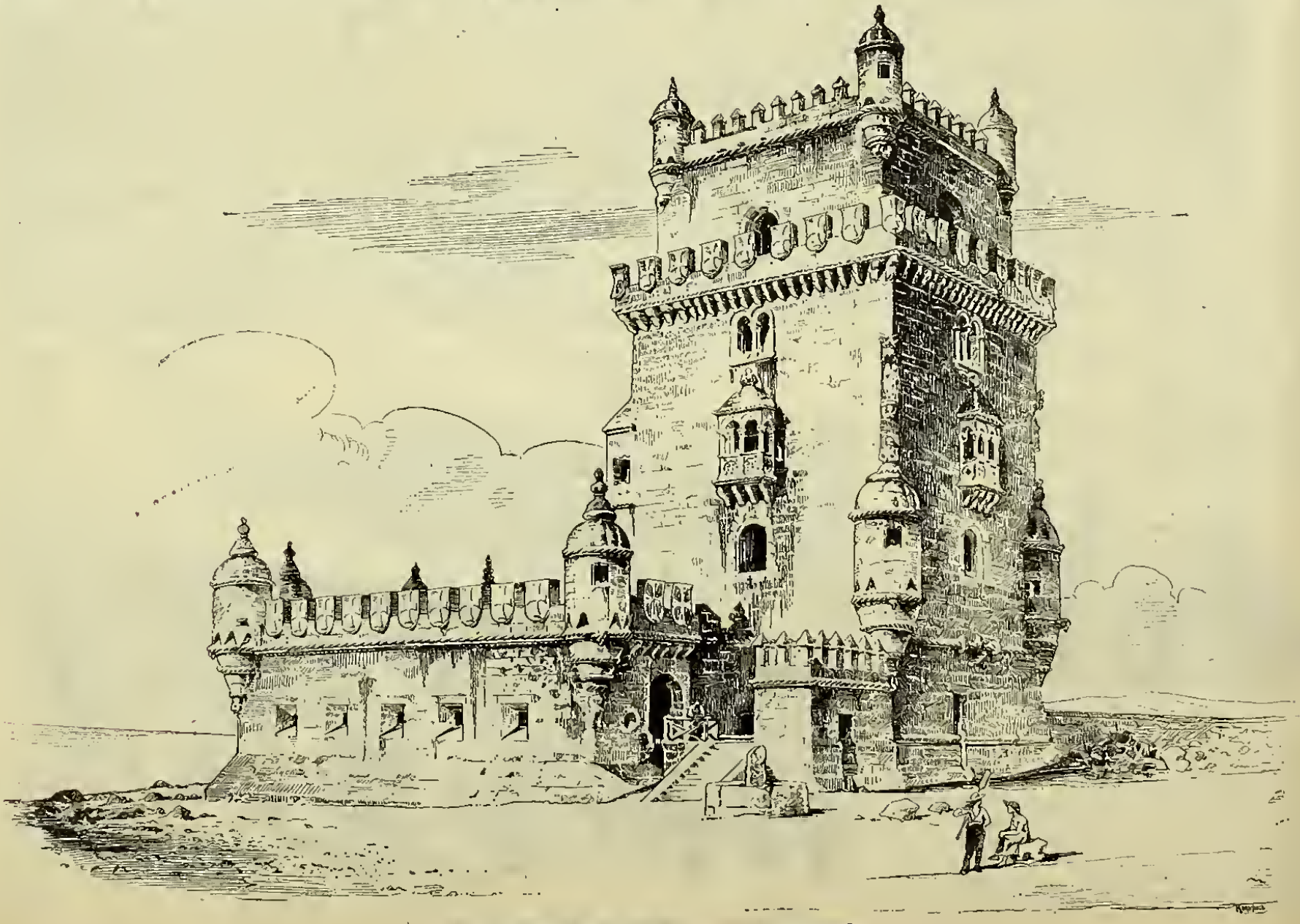
(*To be continued.*)

Portugal Laurels by the Seaside.—

For general planting near the sea, the best shrubs are to be found among evergreens, though some of these do not appear to thrive any better than the deciduous trees, and among the worst is the Portugul laurel. Within the shelter of the low walls in front of the villa gardens facing the beach it grows, but above the shelter of the wall it makes no progress, and the tops look as if they had been scorched by fire. Beside the Portugal laurel, and fully exposed to the blast—and we should say within reach of the spray from the sea—the lanrustinus thrives amazingly, making a large and densely furnished bush, such as is seldom seen in inland situations. It is quite a substitute for the laurel.

THE TOWER OF BELEM.

The annexed engraving, taken from *Architektonische Rundschau*, represents the singularly picturesque fortress called the Torre de Belem, which was erected about the end of the fifteenth century, in the town of Belem, a suburb of Lisbon, Portugal. The building is situated on the north bank of the Tagus, close to the water's edge, and its batteries command that river.



THE TOWER OF BELEM, NEAR LISBON.

RESTORATION OF ROMAN RUIN AT REIMS, FRANCE.

The gate known as the Porte de Mars at Reims, in France, one arch of which has been recently restored, a first step toward the restoration of the whole monument, is the only one remaining of four similar gates or triumphal arches which were used in the city of Reims while under the dominion of Rome. It consists of three arches and eight columns of the Corinthian order, measuring 42½ feet in height. The middle arch, which is the largest, measures 49 feet in width and 38 feet in height. It is called the Arch of the Seasons, and the sculptor had represented the twelve months of the year. Unfortunately, five of these bass-reliefs are almost entirely destroyed, and the seven others are very much damaged. The left hand arch is called the Arch of Remus, and represents Romulus and Remus under the wolf, and at the right and left of the children are standing figures of Faustulus and Acca Laurentia. The arch at the right is called that of Leda, and represents Leda and the swan, with a Cupid carrying a torch above them.

Until 1544 the Porte de Mars was actually used as the gate of Reims, but at that time, owing to the growth of the city, it became necessary to carry the gates further out, and the Porte de Mars is found buried (incredible to believe) under the rubbish brought there for leveling the new routes. Discovered and unearthed in 1812, the government has recently classed it among the monuments of historical interest, and has voted, in conjunction with the municipal government, the funds necessary for the preservation and restoration of this important ruin.—*L'Illustration.*

The Equitable Building, New York.

Another wonder has been added to the many—of an architectural kind—to be found in New York, and that is the court or arcade of the remodeled Equitable Life Assurance building, on lower Broadway, opened on May 2 for the first time.

The court is in the center of the building on the ground floor, and is 100 feet long, 44 feet wide, and 30 feet high. Its walls, for their entire height, are made of highly polished Ste. Baume granite. Double pillars of the same material are ranged along the sides of the walls at regular intervals. Their bases are made of Knoxville (Tenn.) marble and their capitals of Algerian onyx, all highly polished, and producing a beautiful effect. Around the tops of the columns runs a layer of polished Knoxville marble, then a layer of dark Italian marble, then another layer of Knoxville marble, from which the arched roof of the court springs in a graceful, symmetrical curve.

The roof or dome of the arcade is of prettily designed stained glass and rests on arches of Knoxville marble, in which panels of bright polished Italian marble are set.

The floor of the arcade is tessellated, white and pink marble being used in its construction, and being set in squares, with diamonds cut in each corner and a circular piece of pink marble set in the center of each.

At the end of the arcade is the wide marble staircase that runs up through the entire eleven stories to the roof. Above the first story the railing is of iron, in fancy and elaborate design, neatly gilded and painted, but on the first story the balustrades are of pure Mexican onyx, beautifully carved, and are capped by a huge rail of polished granite. The newels of this staircase are also of Mexican onyx, a foot thick. They are surmounted by two bronze figures, which are to support candelabra of electric lights, and on their face have the monogram of the society, "E. L. A. S.," in big letters of polished brass.

At the eastern end of the arcade, in the arch of the dome, there is a panel of mosaic work that is said to be one of the finest things of the kind in this country. In its center is the draped figure of a woman seated on a dais, with her hands about two children on either side of her, as though protecting them from some impending danger. On either side of the figures of the woman and children are those of two warriors—Greek in spirit—one of whom holds a sword and the other a spear, and under the panel the motto of the society, "Vigilance and strength defend the defenseless."

The arcade was crowded with people on the opening day, and every one of them, after they had explored all the beauties of the place, returned to get another look at the wonderful mosaic.

The arcade is reached by the main entrance on Broadway, a hallway twenty-two feet wide, in the construction of which the same materials were used as in the arcade, and running from the arcade through to Nassau Street is another wide hallway which is intersected at right angles by the hallways running from Pine and Cedar Streets. In all these hallways, which are brilliantly lit up with electric lights, the walls are of Ste. Baume granite, the columns of the same material, with bases of Knoxville marble and capitals of Algerian onyx.

The frames of all the doors and windows in these hallways are of old English oak, elaborately and beautifully carved. This oak lay in a lumber yard in England for sixty years, and was imported by the life assurance society for the very use to which it has been put.

Along the sides of the hall leading to Nassau Street there are to be erected a lot of shops or booths, which will be called "a bazar of all nations," where one can buy anything from a toothpick to a theater ticket. These will be opened in a few days.

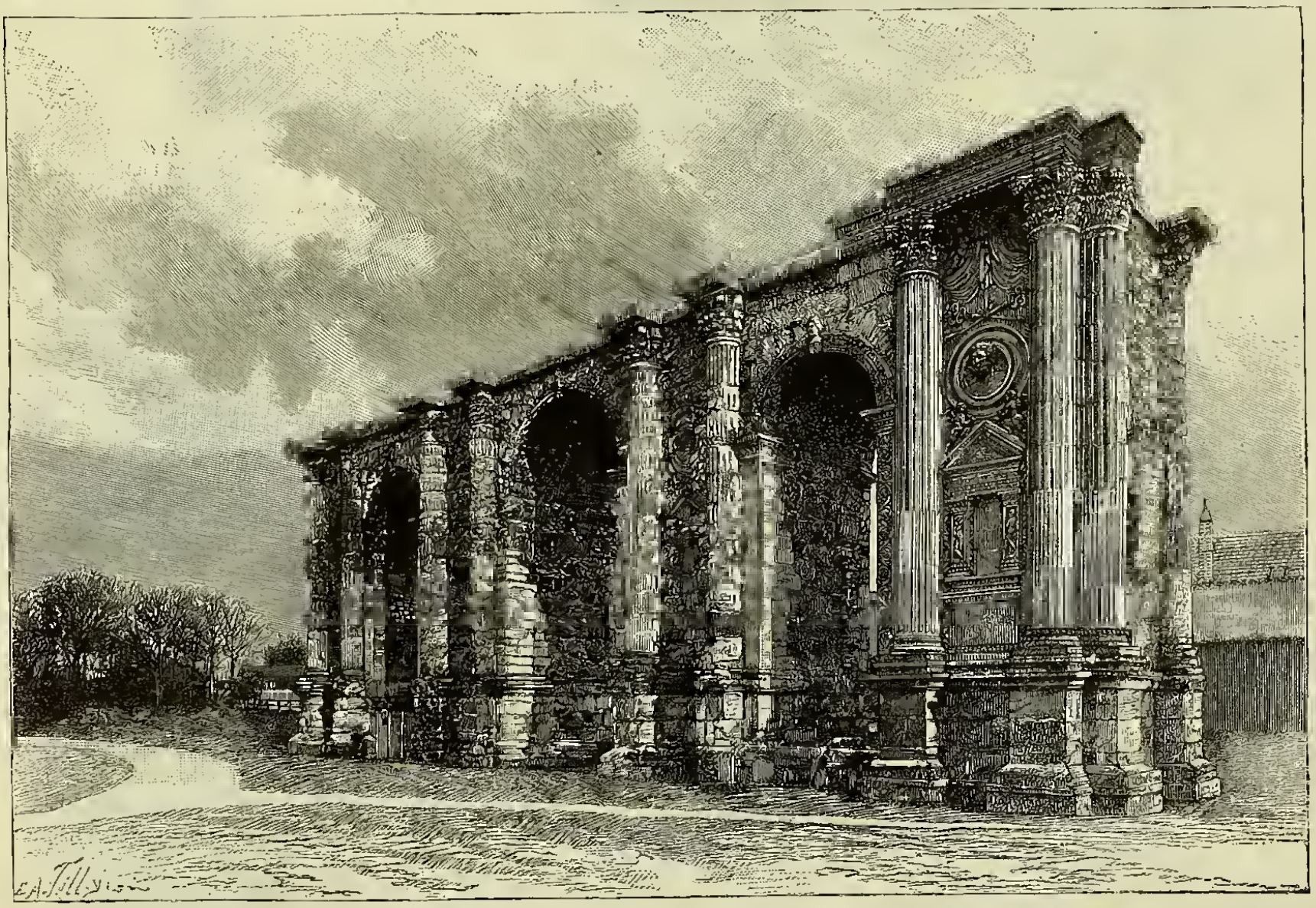
It was on May 1, 1886, that the alterations on the Equitable Life building were commenced, and now the work is practically done. In that time two immense buildings were torn down, one side was taken out of the Equitable building itself, almost its entire interior was remodeled and another story was added to it, and the huge wing on the corner of Pine Street built from the foundations up.

It was a tremendous job, and an army of men were kept at work day and night in the whole of that time. Mr. Henry B. Hyde, the president of the society, personally watched every detail of the work, which was under the direction of George B. Post, the architect, and David H. King, Jr., the general contractor. No less than thirty-one sub-contractors were employed on the work.

"We worked night and day," said Mr. Hyde to a *Herald* reporter, "and now everything is ship shape. Our building covers an acre of ground, and has six hundred offices in it, less than twenty of which yet remain unrented. You may get an idea of the work we have done when I tell you that about a year ago all the granite and marble used in the new portion of the building lay in the quarries uncut and untouched."—*N. Y. Herald.*

Enameled Brick of Different Colors.

A building brick which is in use in England and Germany is covered with an enameling compound made as follows: One hundred and fifty parts fluorspar, 60 parts Paris white, 50 parts lime, 50 parts oxide of tin, and 50 parts kaolin. These ingredients are pulverized and triturated to an impalpable powder, and reduced to a homogeneous mass, which is calcined in a crucible. After it has cooled it is again reduced to a powder. Water is added and the mass is ground to the consistency of cream. The portion of the brick to be enameled is then dipped into it and the brick submitted in fire clay cases to a heat which fuses the enameling compound. A black enamel is produced by adding to the ingredients mentioned above black oxide of cobalt, black oxide of manganese, and umber previous to the pulverizing and calcining. Blue enamel can be made by adding black oxide of cobalt; green by adding sub-oxide of copper; red by adding sub-oxide of copper and red oxide of iron.



THE HISTORIC MONUMENTS OF FRANCE—THE ROMAN ARCH OF MARS, AT REIMS.

Preservative Fire-proof Paint.

To the Editor of the Scientific American:

I give you, and the many intelligent readers of your valuable journal, a recipe for the best fire-proof paint extant.

Take equal quantities of common salt, alum, soluble glass, and tungstate of soda, four parts lime or lead; mix with linseed oil to proper consistency; put on three coats. It is fire-proof, and posts and other woods exposed to the weather will last 30 to 60 years.

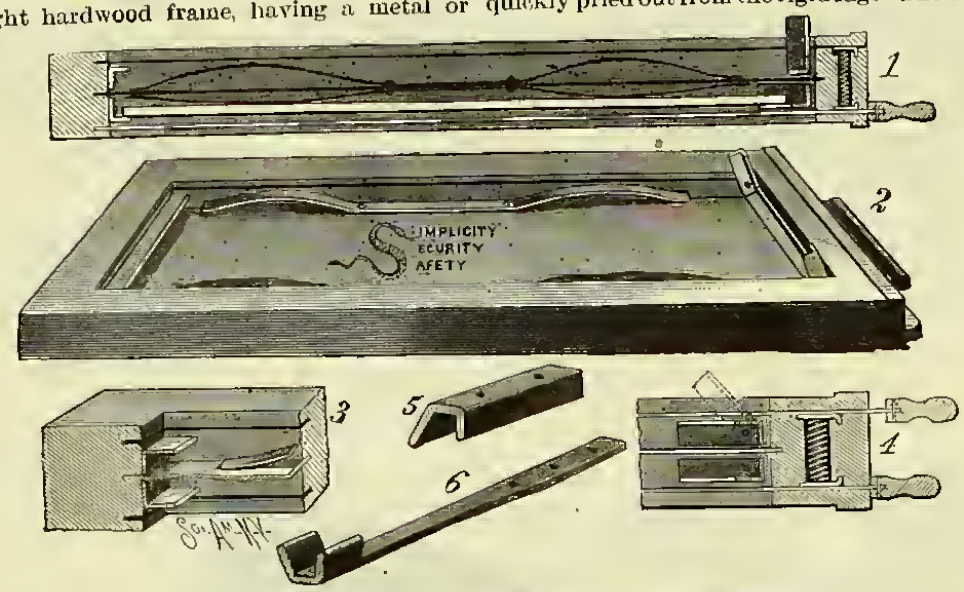
F. M. SHIELDS.

Coopwood, Miss.

WARNER'S IMPROVED DRY PLATE HOLDER.

One of the most serious annoyances a photographer has to contend with in the present day of lightning dry plates is a leaky plate holder, particularly when the latter is composed of one or more separable parts, since the slightest trace of light entering at some minute crevice will frequently damage a day's work. By its simplicity, solidity, and ease of operating, the holder here shown possesses features very desirable for out of door photography, in that it is perfectly light tight, strong, and compact.

Fig. 1 represents a longitudinal section, in which the upper slide is withdrawn. The body of the holder consists of a light hardwood frame, having a metal or



WARNER'S IMPROVED DRY PLATE HOLDER.

gelatinized fiber septum in the center, upon each side of which are riveted very light flat steel springs, shown clearly in Fig. 2. In the lower half of the holder (Fig. 1) may be seen a plate in position. An angular metal strip is rigidly secured on the left-hand end of the inside of each plate compartment, intended to hold one end of the sensitive plate, while at the opposite end is a movable or pivoted angular strip or clamp provided with projecting ends, which, when thrown up, permits the sensitive plate to freely drop down into the holder, resting, as it were, upon a bed of springs.

To insert the plate, the holder is held with its narrow end resting on a support at a slight angle, then the exposing slide is withdrawn, and the plate, film side out toward the operator, is slid over the spring under the left hand angular strip. In this position the other free end of the plate projects slightly above the holder. The right hand clamp is now turned down over the end of the plate, pressing the same down into position. The springs compensate for any variability in the thickness of the glass. Hence the film side of the plate remains always in the same plane and in focus. The exposing slide is next inserted, and the holder is filled ready for use.

The pivoted clamp, it will be noticed, has the pivot located just one side of the center, and as it is turned down over the plate, the latter pushes past the line of the pivot, thus securely locking the plate. The upward pressure of the plate cannot open the clamp. The latter is also held by friction on the sides of the holder.

Special cut off light valves, consisting of plates with one side bent down, forming an angle, to prevent slipping, and also arranged to fly outward by a miniature spiral spring between them, as the slide is withdrawn, and effectually close the slit, may be seen in Figs. 1 and 4.

In removing the sensitive plate, the pivoted clamp is first turned up. At once the springs underneath force one end of the plate up and out of the holder, when it is easily caught with the fingers and slipped out. This feature of the holder is quite important, since in ordinary holders the operator is obliged in many cases to dig out, as it were, the plates with the fingers, being very apt to injure or scratch portions of the film. Fig. 3 is an enlarged view of the rigid angular strip. Fig. 4 shows the pivoted clamps down, when holding the plates. The dotted line indicates the position when thrown up.

Fig. 5 represents another form of a rigid angular strip, made in one or two lengths, intended to be substituted for that shown in Fig. 3, with the bevel side downward, and in conjunction with two spring clamps, bent in the shape of a half bow, secured to the inside end of the holder in place of the pivoted clamp. With this latter device the plate is inserted by putting its lower end in the two spring bow forks, then by pressing down on the edge the plate until its upper end slides under and snaps, or pushes up into the rigid beveled lugs in the upper end of the holder. To remove the plate a knife blade or a thin steel key is passed over the upper edge of the plate. Then by pressing down it is quickly pried out from the rigid lugs. The beveled shape of the latter is intended to compensate for the varying thickness of plates.

The holder being made in one piece is perfectly tight, while the arrangement of the clamps permits uneven and rough-edged plates to be quickly and easily inserted.

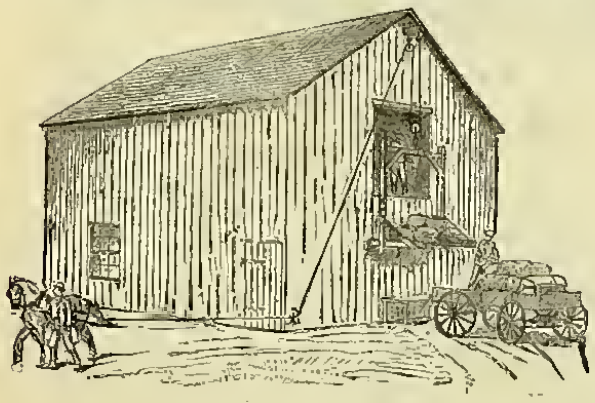
It should also be mentioned that the slides of the holder are made of gelatinized fiber, a new material, light and as enduring as steel and not affected by moisture. The surface is slightly roughened and may be written upon, serving as a memorandum of exposures. The inventor claims that by substituting this fiber for metal, together with the other features, he has an extremely light holder, one that, in fact, is without a peer for convenience and safety.

Further particulars may be had from the patentee, Mr. M. P. Warner, 69 Lincoln Street, Holyoke, Mass., who, we understand, desires to negotiate for the sale of territorial rights.

UNLOADING GRAIN.

Mr. M. H. C. Gardner of Orange Co., N. Y., writes as follows to *The Rural New-Yorker:*

"One of the most tiresome jobs in the busy days of thrashing is to put the grain up in the granary, while



UNLOADING GRAIN.

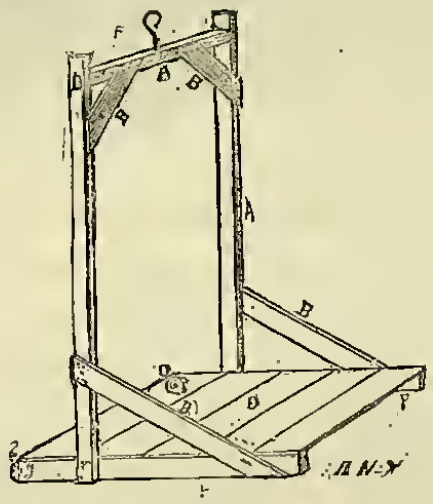


Fig. 1.

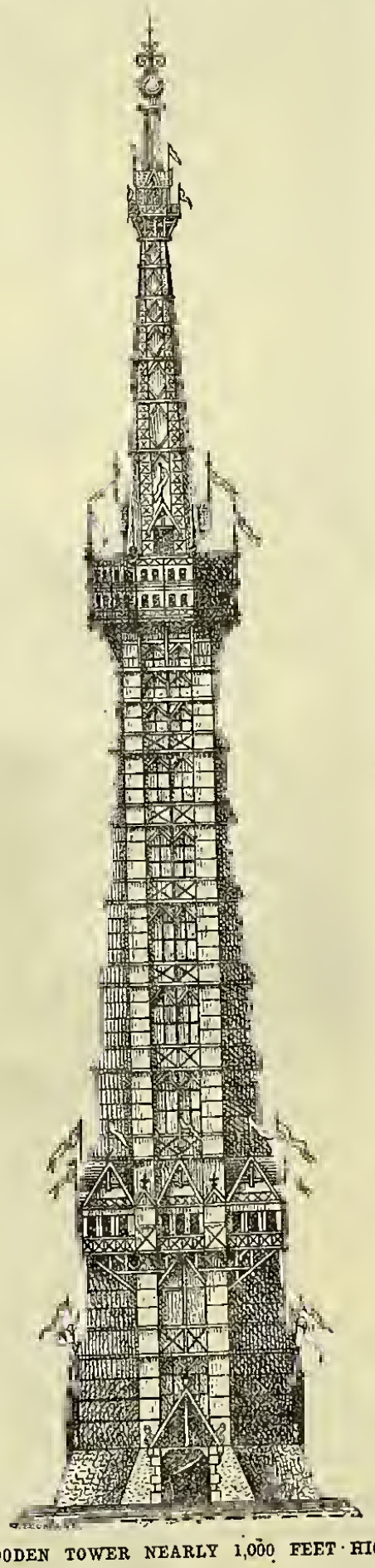
the machine stops for a rest. The bags must be emptied, and quickly, as time is precious and all hands have to work hard to feed the machine and take care of the straw, so that when it stops men are usually not in the humor to carry away 75 to 150 bushels and empty it into bins up a pair of stairs. The thrashers who come and thrash my grain, year after year, all say my way of hoisting wheat or other grain "beats 'em all." Back the loaded wagon to the elevator, which rests on a platform level with the wagon, place the bags on the elevator, and the horse instantly raises it to the second floor, where men empty the bags into bins. It is surprising how quickly 100 bushels can be unloaded without any straining or unnecessary lifting. The contrivance is simple to construct. It can be made with saw, hammer, and nails, or it may be mortised together."

Fig. 1 shows how the elevator is made. The dimensions are as follows: A A A, 3 × 4 inch scantling; B B B B, 1 × 6 or 8 inch; C C, small wooden friction wheels to run against the side of building; D, inch flooring; E, screw hook; F F, sills, 2 × 4 or 6 inches.

A WOODEN TOWER NEARLY 1,000 FEET HIGH.

On the occasion of the great International Exhibition of Sciences and Industry at Brussels in 1888, it is proposed to erect a 300 meter (984 foot) wooden tower after designs by Messrs. Hennebique and Neve.

This tower, a general view of which is given in the annexed engraving, is to be 174 ft. square at the base. It will consist of a parallelopipedon supported by eight counterforts having a projection of 49 ft. and being 16 ft. in thickness. The calculations have been based upon the supposition that the tower will, through its inertia solely, resist an upset thrust produced by a wind exerting a pressure of about 65 pounds to the square foot. On giving the tower a total weight of 15,000 tons, with a base 174 ft. square, the moment of resistance to overturning would be much greater than the moment of overturning due to a wind such as above supposed.



WOODEN TOWER NEARLY 1,000 FEET HIGH.

The sections of the framework at each point of the height have been determined in the same way. The wood required would thus be 353,200 cubic feet.

Seven elevators in the interior will give access to the three stories, in which will be established restaurants, a belvedere, and an observatory. It will be possible to erect the tower in one year, and it will cost, at the most, $400,000. The authors of the project think that this sum can be easily raised by the formation of a society issuing stock at $2 per share, and giving the right to ascend the tower.—*Chronique Industrielle.*

GEORG EBERS.

Georg Ebers, the German Egyptologist, has just celebrated his fiftieth birthday; and as this point of a man's life is supposed to be the time of all others for reviewing his past, we, too, will take at least a hasty glance at the work of this scientist, novelist, and poet. He was born in Berlin, and went to school and college there and at Gottingen; but while still quite young he was obliged by illness to leave his home, and he went to Egypt. During this and a subsequent journey to the land of the Pharaohs he pursued the studies on which his books were afterward founded. His labors for the dissemination of knowledge of the history of the Nile country were not, however, confined to his writings, for he taught at the University of Jena, and afterward received a professorship at Leipzig.

Even a short sketch of the life of Georg Ebers would be incomplete without some reference to his charming family life and his delightful home on the banks of Starnberger Lake, in Bavaria, which is shown in the accompanying cut, taken from "Ueber Land und Mehr." Here he has written some of his best poems, and we trust that these congenial surroundings will continue to inspire him in the future as they have in the past.

THE COUNTRY RESIDENCE OF GEORG EBERS, STARNBERGER LAKE.

Nothing could be more charming than the scenery in the immediate vicinity of this comfortable little dwelling. The water view reminds one of our own "Thousand Isles" on the St. Lawrence.

Copper as a Roofing Material.

Some time ago we drew attention to the reduction in the price of copper, and to the advantages possessed by it in comparison with other roof coverings. Since our remarks appeared there has been a desire on the part of many to introduce the material for buildings. As a roofing material copper has pre-eminently those properties which render it particularly desirable. In the first place, it can be hammered and shaped to any form without injury. Resisting oxidation and acids, it is found to last much longer than other metallic coverings; it is more durable than lead as a material for bearing traffic, it is considerably lighter, and, on the whole far more pleasing in color. Perhaps its most important qualification is its comparative lightness for roofs. The same firm remarks that "it may be used advantageously at one-fifth the weight of lead—that is to say, a building which would require five or six tons of lead to keep it weather proof may be rendered equally secure and for as long a time with one ton of copper." Even if we say that copper of one-third or one-fourth the weight of lead can be used, a very important reason can be given for its preference. The saving of timber or iron in the roof framing is a consideration of great moment in very many instances.

If copper can be bought at less than half its former price, and can be used at considerably less weight per foot than lead, there is evidently great advantage in using it. We have good reason for stating that 16 oz. sheet copper can be supplied and laid at from 1s. 3d. to 1s. 6d. per foot superficial. For lead coverings the timbering must be of heavy scantlings compared with those required for copper. For traffic, the latter material is found to be far more able to stand the wear than either lead or zinc. The cost of laying copper is rather more than that of lead. Referring to Laxton's, 16 oz. sheet copper to flats and gutters, including seams, labor, ties, and nails per foot super., is 2s., and 20 oz. sheet for flats 2s. 6d.; but these prices are high, and tend to mislead. Comparing copper with zinc, the latter has the advantage in first cost, since zinc can be laid down as light as copper for one-half the price. But what of other matters? The two coverings cannot be compared as regards durability or appearance. We all know how zinc wears in most towns; how it gets eaten away by the action of the atmosphere, or rather by a voltaic action that is set up. We have known zinc roofs and flats that have had to be replaced in the course of seven or eight years. Copper will last at least four or five times that period uninjured. It may be stated generally that the cost of 16 oz. copper is about double that of 16 gauge (24¾ oz.) zinc. Of course copper, like zinc, should be laid without solder, and allowance made for expansion and contraction. The adaptability of copper for architectural purposes, especially roofs, mansards, domes, and lighter ornamental features, such as turrets, is one, we think, of its chief recommendations. In London the material, wherever it has been used, has worn well. The roof of the pumping station of the Main Drainage System, Grosvenor road, is covered with copper, and is a very good test of its durability in a very exposed situation. It has also been used to cover the cupolas of the new meat, fish, and vegetable markets at Smithfield; these features having the material applied in stamped patterns, the work having been executed by Messrs. Holden & Co. To the architect the value of using a covering for his ornamental features, that are generally inaccessible for ordinary repair, is of importance. In these cases, even if a little more expense is incurred at the commencement, the cost is quickly saved in repairs. The great toughness and malleability of copper enable the workman to bend it to all ordinary curves and angles, and to boss the work by hand. It can be even beaten into thin leaves. From these considerations we think that the profession would be consulting their best interests in availing themselves of copper for their ornamental roofs, or where durability and lightness are desirable qualities. Comparing the appearance of copper with zinc and lead, we think it will be at once admitted that the former possesses a more agreeable color for this climate, and that the rust or green coating it takes after a few years is by no means unpleasing. In France and, indeed, in this country, copper was much employed by the mediæval builders; but since the introduction of zinc, which is much cheaper, it has seldom been used. Now, however, the extremely low price of the material has called attention to its qualities, and it is destined once more to take its place as the best covering metal we possess.—*Building News.*

Waxing Floors.

Take a pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in three pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for, if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close-grained wood, and more if the wood is soft and open-grained. Even professional "waxers" are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continuing your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of any of the common "driers" sold by paint dealers, japan, for instance, in the proportion of one part of the drier to six parts of turpentine. When the floor is a large one, you may agreeably vary the tedious work of polishing by strapping a brush to each foot and skating over it.

THE fastest train in the world is said to be one between London and Bristol, England, which makes the distance (118¼ miles) in 120 minutes.

THE EDELWEISS.

(LEONTOPODIUM ALPINUM.)

If there is one plant more than another that is sought after by tourists on the Swiss Alps, whether they be plant lovers or not, it is the edelweiss, a singularly curious plant—so curious, in fact, that no one who once sees it is likely to mistake any other for it. It is the badge of tourists, although, as everybody knows, they often get their badges second hand, for to get to the haunts of the edelweiss is sometimes not an easy matter. There has been—indeed, still is—a good deal of nonsense written about the edelweiss. Some would lead us to believe that some deep secret is connected with its culture, and that it will not succeed except in the temperature of an ice-house. As a fact, it is one of the easiest plants to grow if not coddled. Where failure occurs most frequently is in the case of old plants that have been torn up carelessly and sent home, where they, perhaps, arrive half rotten; whereas, if people gathered the seeds and sent them instead of old plants, they would experience no trouble concerning culture, for home-raised seedlings are as easy to grow as those of any other hardy perennial. Even with us the edelweiss dislikes division, and rarely if ever does well after that operation. The best plan we find is to choose a rather sunny position for it, close to a bog or shallow swamp; give it a good depth of rich peaty soil, and prick out the seedlings as soon as ready to handle. Where the bottom is not cool, a little more shade will be required than where it is so, and if grown close to a wall, better success will be attained than elsewhere. The plan of raising plants from seed applies also to most other alpines. The edelweiss is very plentiful on the Himalayas, at 14,000 feet elevation, in Cashmere, Kurum Valley, and Southern Europe. With us it flowers in July and August.—*K.*

THE EDELWEISS (LEONTOPODIUM ALPINUM).

THE LARCH AS A LAWN TREE.

W. GOLDRING.

Mr. Marnock was not singular in his opinion when he said some time since that "the larch as an ornamental tree is much neglected." It is indeed a neglected tree in ornamental planting, even in parts of the country where it is not grown in plantations for timber. Perhaps it is because it is such a common plantation tree that it is ignored by planters, yet in the whole range of ornamental trees there is certainly none more beautiful than a vigorous young larch, particularly when seen in early spring, just as its tassels of new foliage unfold, accompanied, may be, by strings of tiny cones brightly colored and fragrant. The larch, like the

A YOUNG EUROPEAN LARCH.

deciduous cypress (Taxodium distichum), seems to burst out suddenly with the freshness of its young leafage, but the exquisitely graceful growth of the larch makes it the most beautiful tree of the only two deciduous conifers commonly cultivated. To be really beautiful as a lawn tree, a larch must be young, vigorous, and well cared for from its youth upward, and must always have plenty of room about it to develop itself fully, otherwise, it soon loses its branches, and then half its beauty is gone. An old plantation larch is not a lovely object, not even picturesque, as an old Scotch fir generally is; but, planted in good soil in a sheltered spot on a lawn, and perfectly isolated, a larch may be kept in perennial youth, so to speak, and produce a finer effect than half the modern conifers which crowd every garden. I remember seeing last year a grove of young larches on a lawn that greatly impressed me by their elegant growth. They were of different sizes, the tallest being about 30 feet, the shortest about 10 feet, and they were so grouped that the whole mass, numbering about a score, looked as if they were nature-sown seedlings, so informal, yet so effective, was the outline of their tops. The spot was sheltered by a plantation from the prevailing winds from the southwest, and the soil was good, so that the trees were in favorable circum-

CONING BRANCH OF LARCH AND WINTER TWIG.

stances. A grove of larches, including, besides the common, the American, Japanese, and others, should be planted in every good garden, on a lawn, or in the pleasure grounds.

PALMS FOR ROOM DECORATION.

(CHAMÆDOREAS.)

This genus consists of numerous dwarf growing plants, with, for the most part, slender stems and elegant pinnate or feather-like foliage. In a wild state they are always found growing in comparatively elevated situations under the larger forest trees as underwood, and but rarely in the open. Under cultivation they thrive best in an intermediate house, well shaded and liberally supplied with moisture, and many of them are admirably adapted for room decoration, as, just after the first year from seed, they become extremely ornamental, and their bright, smooth, green leaves are easily cleansed from dust. Even in comparatively small pots they continue to increase in beauty and stature annually. As a matter of course, they should not be allowed to stand close to the windows in severe weather, nor should they be subjected to cold draughts. If the foliage is occasionally sponged and the roots well supplied with moisture, in the form of tepid water, given at midday, few plants excel these Chamædoreas as decorative objects, a fact fully recognized in Germany, where they are largely used in this manner. Many of them flower annually, and their long, branching inflorescence adds materially to the interest that attaches to them. As in most instances they perfect their seeds, a supply of young plants can be easily obtained at little expense, which is not the case with the majority of the palm family. Chamædoreas should be potted in a mixture of peat and loam, and liberally supplied with water. Indeed, failures with them are usually traceable to a meager supply of moisture. The first year's seedlings produce broad, simple leaves, deeply divided at the ends, but even in this state they are ornamental. In the second year they begin to develop pinnate leaves, which increase in length and breadth as they get older. In a few instances, however, this broad, deeply cleft leaf (bifid) is the normal condition of the species of which C. geonomæformis affords an excellent example. The Chamædoreas are all natives of America, and the following kinds are among those which we have found to thrive best as indoor plants, viz.: C. graminifolia. This is a slender, grass leaved kind, as its name implies, and it is one of the most elegant of the family. Its leaves are plume-like, dark glaucous green, and when fully developed attain a length of a yard or more. Its branching inflorescence is pendulous, and about a foot long. C. elegans has a more robust stem than graminifolia, and the foliage, which is gracefully arched, grows from three feet to four feet long in fully developed specimens, while the leaflets are some six inches long and about one inch broad, tapering at either end, and bright green. C. sartori resembles elegans, but the leaflets are broader, and do not taper so much toward the base. It has a very hardy constitution, and is one of the best for the purposes indicated. C. arenbergiana is also a very beautiful kind. Its bright, green leaflets are pendent, and taper to a tail-like point. C. wendlandi is another beautiful species, and, perhaps, the most useful of all for room decoration. Its bold, arching green leaves are about a yard long, while the leaflets are some twelve inches in length and two inches in breadth. C. glaucifolia is a slender stemmed kind, with long, arching, feather-like leaves, having a milky glaucous hue on both surfaces. C. geonomæformis attains a height of about four feet, and bears simple, deeply cleft or bifid, strongly ribbed, deep green leaves, which are some nine inches or more in length, and from four inches to six inches in breadth. Its graceful pendent flower spikes add much to the general effect, although the flowers are of the same hue as the leaves. C. ernesti-augusti is also a bifid leaved species, which attains, when fully grown, a height of five feet or six feet. Its stem is about two inches in diameter, and conspicuously ringed by the scars of the fallen leaves. These are broadly sheathing and stem clasping at the base, from one foot to two feet long, cleft for about half their length, serrated at the edges, conspicuously ribbed, and dark green in color. When in flower this little palm is especially ornamental. The male and female flowers are produced on separate plants. In the former the spadix is branched, the numerous long, slender branches being densely clothed with little round orange scarlet flowers. The female plant produces a single (or more rarely a double) thick, fleshy

CHAMÆDOREA GEONOMÆFORMIS.

green spadix, studded with numerous bead-like, coral red flowers.—*W. H. G.*

For the foregoing engravings and descriptions thereof we are indebted to *The Garden*.

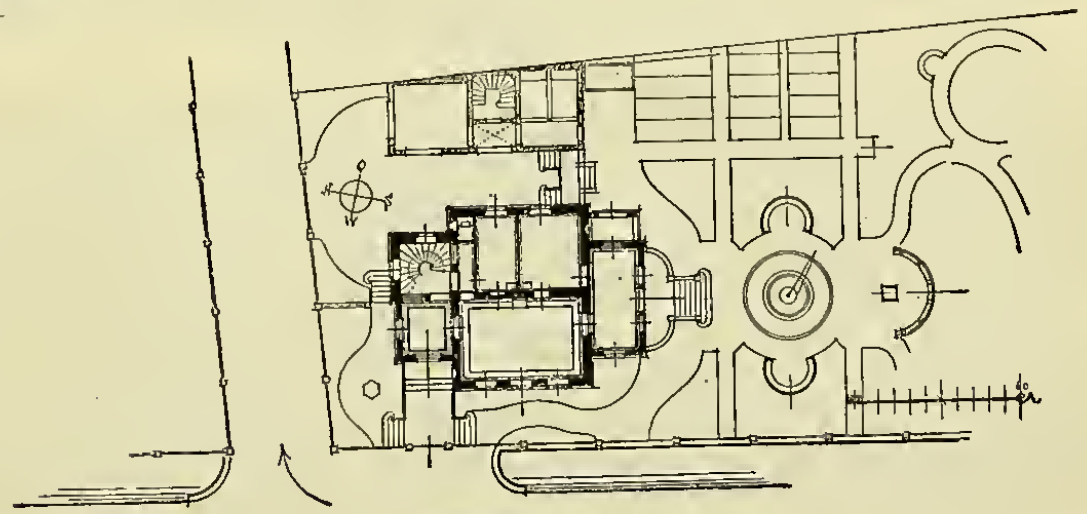
A NEW pocket camera has been invented. It is inclosed in an ordinary silver watch case, and is said to do very good work by the dry-plate process.

A HUNGARIAN VILLA.

We give a sketch of a country house or villa lately erected in Loebau by Theobald Hofmann, architect, Budapest, Hungary. Our engraving is from *Architektonische Rundschau.*

Cathedral of Notre Dame, Paris.

The cathedral of Notre Dame, Paris, was built about 1177; its length is 414 feet, height 102 feet, and width 144 feet, without accounting for the space allowed to the forty-five minor chapels; it is built in the Gothic style of architecture, in the shape of a crucifix; it has two large square towers that impart an aspect of stateliness to the fabric. The four lofty windows of stained glass are elaborate; the sanctuary and high altar are of marble. On the front are three doors ornamented with antique sculpture; a gallery, supported by small columns, extends from one extremity of the building to the other. The two square towers, above the lateral doors, are each 204 feet high; a staircase, containing 389 steps, leads to their summit. From the towers a splendid view of Paris and its suburbs can be obtained. Victor Hugo laid the tragic fate of the Goblin Monk, in his romance of "Esmeralda," to occur from one of these lofty pinnacles, denominated the South Tower, in which there hangs a bell similar to Big Ben, termed "Bourdon;" it weighs 2,000 lb.; it is 8 feet in diameter, 8 feet high, 8 inches thick, and the clapper weighs 976 lb. The edifice is decorated with pyramids, figures, and obelisks. The roof is covered with lead. Three exterior galleries surround the building; the first, higher than the chapel; the second, above the choir and nave; the third, about the great roof, furnishes a passage. One hundred pillars support the interior vaults; the nave and choir are bordered by a couple of double aisles. Above the vaults of the aisles are spacious galleries, from which all the religious ceremonies are seen. The interior is also lighted by 113 window and three rose lights. The entry to the choir is adorned by two estrades of Italian marble and a handsome grate, raised 5 feet above the pavement. The grate contains four square panes, two of which are fixed; these are surmounted by eight bronze spears, finely worked and tipped with gold; the panes are of Tuscan design, on a blue enameled surface of stars at each angle. The six arches of the sanctuary have handsome grates, crowned with Etrusean frieze; they were constructed of steel after the designs of Fontaine and Percier. In the choir are a pair of pulpits, a double row of stalls, crowned by a carved wainscot, representing the circumstances in the history of St. Mary. To the right are bass-reliefs, executed by De Goulon, Taupin, Goupel, and Bellau. The two pulpits are enriched with bass-reliefs showing the martyrdom of St. Denis, the cure of Childebert I. by St. Germain, Bishop of Paris, from sketches by Masse. Eight paintings depict in the upper section of the choir actions in the life of the Virgin Mary. To ascend the sanctuary are four steps of Languedorian marble, with balustrades of fine Egyptian marble, adorned with two chandeliers, each 7 feet high, the lower portion of green marble, richly gilt. The pillars are of Serancolian marble; the main altar is 12 feet 10 inches in height.



A HUNGARIAN VILLA.

AN excellent home made axle grease is said to be made of two parts tallow, two parts castor oil, and one part of pulverized black lead.

Cast Iron Beams under Repeated Impacts.

The effect of impact and vibration upon structures was a leading object of inquiry with the Commission on the Application of Iron, and the first series of experiments instituted upon this subject was to determine the power of beams to sustain impacts many times repeated. For this purpose sixteen bars were cast, all from Blaenavon iron, No. 2, and five at least of the sixteen were found to be slightly defective at some place where they gave way. Whether these small defects were more numerous than would be found in practice, it would be difficult to determine. Six of the bars were each 15 ft. long and 3 in. square, and placed on supports 13 ft. 6 in. asunder; seven were each 10 ft. long and 2 in. square, and 9 ft. between the supports; and three were each 5 ft. long. 1 in. square, and 4½ ft. between the supports. Of these bars, six were bent through one-third of their ultimate deflection at each blow, and five of them bore each 4,000 blows without breaking. The sixth was broken at a flaw with 1,085 blows.

One large bar, bent by impact through five-twelfths of its ultimate deflection, was broken at a defective place with 1,350 blows. Of six bars bent by blows through half their ultimate deflection, five were broken with less than 4,000 blows each; one with 29; one with 127, etc. The only bar which bore the 4,000 blows was one of the smallest kind, or 1 in. square. Of three bars, one bent to seven-twelfths, and two to two-thirds the ultimate deflection, all were broken, the two latter with 127 and 474 blows respectively. The former required 3,700 blows to break it.

Of ten bars of Low Moor iron, No. 2, each 10 ft. long and 3 in. square, placed on supports 9 ft. asunder, and struck in the middle with long continued impact, as before, four broke at defective places and two at sound ones. Three were subjected to impacts bending them through one-third of their ultimate deflections, and bore the test without fracture; of three bent by blows through half their ultimate deflection, two were broken; those bent through two-thirds were all broken. On the whole, it appears that no bar but one, and that a small one, stood 4,000 blows, each bending it through half its ultimate deflection; but all the bars when sound stood that number of blows, each bending them through one-third of their ultimate deflection. It must, however, be borne in mind that a cast iron bar will be bent to one-third of its ultimate deflection with less than one-third of its breaking weight laid on gradually, and one-sixth of the breaking weight laid on at once would produce the same effect, if the weight of the bar was very small compared with the weight laid on it. Hence the prudence of always making beams capable of bearing more than six times the greatest weight which will be laid upon them.—*E. Hodgkinson.*

Cheap Steel Girders.

As an indication of the way in which steel is supplanting iron for structural purposes, it is announced that a leading Middlesbrough firm, Messrs. Dorman, Long & Co., who have attempted to compete with Belgian makers of rolled iron girders and joists, have determined to practically abandon this branch of manufacture, and to roll only steel girders and joists. It is reported that this decision has been made in consequence of the persistence of the Belgian makers in underselling their English rivals, whereby the market is choked with iron girders and joists of very inferior quality, but offered at a price that suits builders and others to whom iron is iron, so long as it is the required size and is painted red. Messrs. Dorman & Co. have, however, started new works for the manufacture of Siemens-Martin steel, which are calculated for an output, when in full operation, of more than 1,200 tons per week. It is intended to turn out all dimensions and sections of girders and joists, which will carry loads of forty per cent. more than corresponding sections of iron, while the increase in price will only be twenty-five per cent. To show how cheap sections of steel suitable for gas holder and roof work can be made, it may be stated that steel joists up to ten inches deep are quoted at £5; joists twelve inches deep are quoted £6 5s.; and fourteen inch joists £6 10s. at Middlesbrough. The largest sections made at these works will for the present be 15 in. by 5 in. by 5 in. to 20 in. by 8 in. by 8 in. Engineers specifying these steel girders will at least have the satisfaction of knowing what they are getting.

A Good Floor.

A good floor should be—
A test of the builder's skill;
Of thoroughly seasoned lumber;
Without creaking boards;
Without splintering edges;
Without gaping joints;
Without curling section;
Flat as a table top;
Rigid and smooth;
Almost imperceptibly jointed;
Undisturbed when laid;
Laid on straight-edged joists;
Without heading joints;
Laid without showing nails;
Of edge-nailed boards;
Laid on a bed floor.

A good floor is a rarity.

THE METROPOLITAN MUSEUM ADDITION, CENTRAL PARK, NEW YORK.

Under the direction of the present board of trustees of the Metropolitan Museum of Art, not long ago, an appropriation of $350,000 was made to add to the building. Mr. Theodore Weston, one of the trustees, was engaged as the architect, and with his partner, Mr. Tuckerman, prepared plans for the structure.

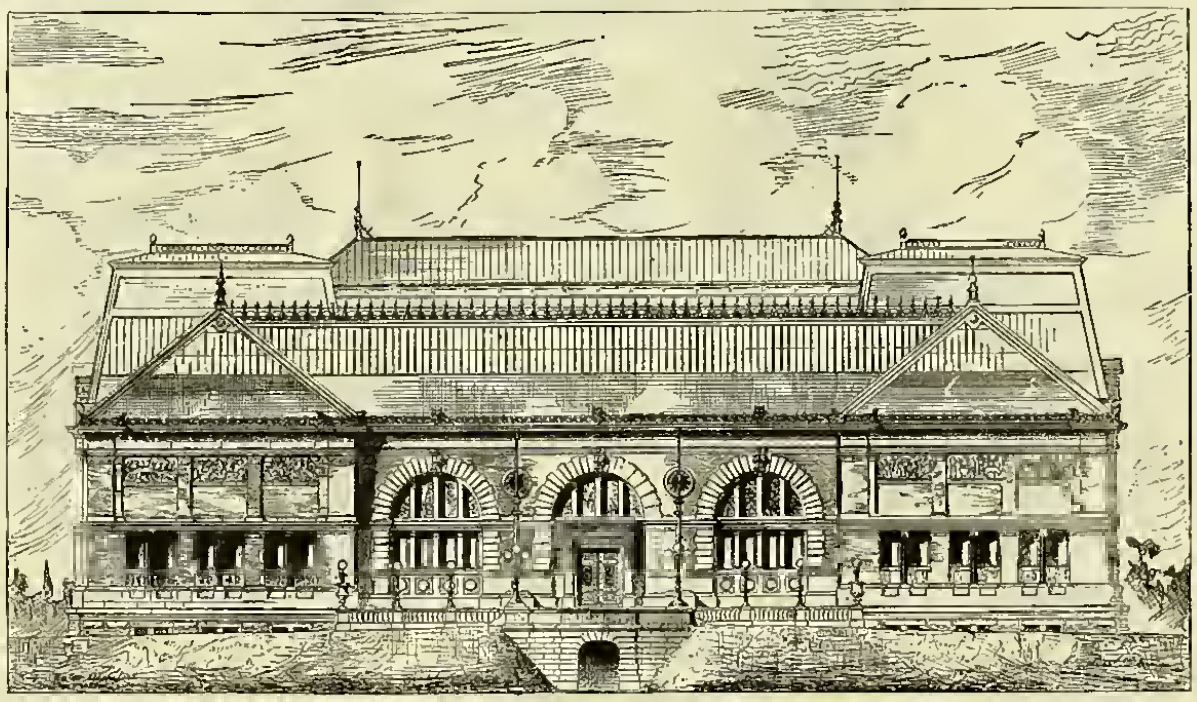
The addition, in connection with the old building, forms a hollow square, the center being an open court across which runs a bridge connecting the two portions of the building.

The intention and aim of Messrs. Weston & Tuckerman has been to provide a building which would be architecturally an ornament to the city and at the same time keep the main idea of the ultimate object of the structure evident.

The treatment is simple and classic, in the modern French school, suggesting the Prix de Rome contests in the Ecole de Beaux Arts, which are familiar to all students of architecture.

The approach to the main facade, which fronts toward the south, passes over a terrace 100 feet in depth, and extending the whole front of the curtain, winding away toward the main driveway in front of the two wings. Directly in front of the portal is the covered driveway leading under the terrace to the administrative departments in the basement. From the terrace is the entrance to the building, which has a frontage toward the south of 233 feet. The front is divided into two pavilions and a curtain.

From the base course of granite rise three round, arched openings, the two end ones serving as windows, the center being the entrance portal. The impost moulding running as a string course through the entire length of the building, and returning on the sides, breaks these openings, the upper part of which is filled between the triple mullions with a rich bronze grille. As is the case with all the openings in the face of the building, the reveals are very deep, and consequently cast extremely heavy shadows, giving a richness, tone, and general effect of solidity. In the spandrels between the center and end arches are two bronze portrait medallions in circular granite frames, one of Michael Angelo and the other of Raphael. The double billet moulding running around the inside of the frame is very rich, and gives the bronze a striking effect in conjunction with the selected brick which fills up the remaining space in the spandrels.



THE NEW ADDITION TO THE METROPOLITAN MUSEUM OF ART, CENTRAL PARK NEW YORK.—WESTON & TUCKERMAN, ARCHITECTS.

The window openings and the transom over the entrance are triple mullioned. The effect of the deep reveal of the arches in these openings has been still further heightened by this arrangement of the mullions, causing almost the entire upper portion of the opening to be thrown into deep shadow. The entrance itself is strictly classic in outline and treatment, and with the bronze door executed in heavy relief, and the bronze grilles, both in the door itself and the windows on either side, give strong effect. In the windows in the side wings the reveals are four feet deep. The heavy lintel is supported by a compound mullion, the main feature of which is a detached column of polished black granite. Behind this comes a pilaster of tooled granite. There are three of these windows in the front of each wing. Above the impost moulding running just over the lintels of these windows the space is divided into three recessed panels, in the upper part of which are set three frieze reliefs in Indiana limestone.

In all there will be eleven new galleries added to the museum.

The partitions throughout the building will be of peculiar construction. Instead of studs, a skeleton iron framing will be used, filled in with plaster of Paris and sheathed on both sides with one and one quarter inch spruce, and covered outside of the sheathing with tightly stretched cloth. The object of this arrangement is to present a uniform wall surface upon which pictures may be hung at any point without having to search about for a convenient beam or piece of studding in which to firmly fix a nail or screw.

The galleries are to be lighted by double skylights. The outer roof is glazed over the iron trusses half way down to the gutters, and beneath this glass and iron roof are other skylights, more ornamental in construction, forming the ceiling to the rooms. This arrangement admits of the inside lights being opened at any time of the year without danger from the weather, and at the same time distributing the light in a very good manner.

The building is strictly fireproof, that is, as strictly fireproof as it is possible to make any building, for no matter how it is constructed, its interior arrangements demand the use of materials that fire will burn. The floors are supported upon iron girders, filled between the spaces with beton cement arches. The surfaces of the floors are housed to correspond with those in the old building. The inner rooms and galleries in the addition, and in that portion of the old building fronting upon the court which is faced with imported glazed white brick, receive by reflected light plenty of illumination. For illumination at night a full electric and gas plant will be provided. The whole arrangement of the building is complete. The necessities and exigencies of a building of this kind have been carefully weighed by Messrs. Weston & Tuckerman, and the result should be highly gratifying to them. The treatment is in good, wholesome architectural taste.

For the foregoing particulars and for our illustration we are indebted to the *Art Age*.

In addition to the rich store of art treasures now within the walls of the Metropolitan Museum, it is pleasing to be able to add that one of the principal galleries of this new building is to be specially graced by a magnificent private collection of paintings, the generous legacy of a wealthy lady of New York. "The Catherine Lorillard Wolfe Collection," for so it is to be known and styled, consists of a large number of celebrated works of art, valued in all at half a million dollars.

The collection is a remarkably even one, showing scarcely a single indifferent piece, the examples of each painter being quite up to his best level. Many of the famous modern painters are represented. Meissonier has two large canvases, "The Two Vanderveers" and "A General and his Adjutants," and one water color, "The Sign Painter." Jules Breton is represented by his big "Pardon in Brittany," a peasant church procession. Rosa Bonheur has a Scotch landscape with cattle in it, and her well known picture of a hound. Troyon has a Dutch landscape, with cattle also. L. Bonnat is represented by "The Egyptian Fellah Woman and a Roman Girl on the Campagna." Cabanel painted a full face and three-quarter length portrait of Miss Wolfe for the collection, and a symbolic "Bride of the Church." "The Christian Martyr" is Gabriel Max's, and "The Ford," Fromentin's. Among the others are Bouguereau's "A Girl and a Child," Bangs' "Arabs in a Turkish Café," Piloty's "Wise and Foolish Virgins," Alfred Stevens' "The Japanese Toilet" and "Preparing for the Promenade," Detaille's "The Freebooters in the Woods," Gerome's "The Arabs at Prayer in a Mosque at Cairo" and "An African Chief," Vibert's "The Reprimand" and "The Startling Confession," Belleconr's "The Betrothal," Hans Makart's "After the Ball." Munkacsy's "The Mont de Piete," and Domingo's "A Spanish Interior." Knaus' "Holy Family" is, perhaps, the best known piece in the collection. Knaus had painted the picture on a commission from the Empress of Russia some thirteen or fourteen years ago, and Miss Wolfe saw it in Berlin before it was finished. The Empress would not take it afterward, and Knaus put it aside, declaring that he would never sell it. Miss Wolfe finally got it at a cost of more than $30,000. Among the other painters represented in it are Edward and Theodore Frere, Henner, Jules Dupre, Diaz, J. W. Preyer, Brion, Merle, Chaplain Chevet, Madrazo, Worms, Gallait, Wehrbach, Danbigny, Volon, Andreas and Oswald Achenbach, Verboeckhoven, Riefsthal, Rousseau, and Hamon.

EXPOSITION OF FINE ARTS AT VENICE.

No place could possibly be found better adapted for an exposition of the fine arts than Venice. It would seem almost that paintings and statues must have been especially made to be placed in that city of palaces. The Italians, be it to their honor, are endeavoring to mend the chain of their glorious past, which has been so long broken. After Milan, Turin, Rome, have done so much, this city of the Doges is now trying to inspire a little life into the arts which formerly were held in such high esteem.

The exposition which will soon be opened at Venice will be held in a palace of a Greek style architecturally, near the Public Gardens, and occupying a plat of land of about 8,000 square feet. It contains forty rooms. It may be reached either by land, by the street San Francesco, where one of the principal entrances is placed, or by gondola or launch on the canal, where the other principal entrance is placed.

The general view of the exposition, which we publish herewith, shows what a magnificent scene will be offered to those who approach the palace by water. Those who are wearied with the promenade through the galleries may rest and regale themselves at the Cafe du Belvedere, which has been built especially for the exposition, but which will be kept after the exposition has been closed. From the terrace of the cafe one may enjoy the beautiful view of the canal, the tide, and sea.—*L'Illustration.*

Root Choking of Drains.

Deep as drainage may be laid, it is never altogether free from the possibility of being put out of order by the roots of trees or of certain kinds of crops, which may penetrate the drains, and form a hindrance to the free passage of the water through them. The roots of the elm, ash, willow, and other trees are known to enter the pipes, and even pass through the ground for several yards to reach them, as if they were attracted by the moisture and air which they find in the pipes, and by the nourishment afforded them there. To obviate this difficulty, it is advisable, where it occurs or is apprehended, to use socket pipes jointed with cement, or to lay the pipes as far as possible from the trees. I have found that embedding the pipes in lime, mortar, or concrete has prevented them from being choked, although close to trees which it was impossible to avoid, and has kept them clear for some years. The roots of some crops, if they should penetrate the pipes, die away when the crops are removed, and are frequently washed out at the mouths of the drains by the strong flow of water through them. Other substances give the drainer a vast amount of trouble in obstructing pipes. Ocherous water, depositing oxide of iron, is a common source of obstruction. It appears to harden and consolidate as it receives air through the pipes, and ultimately chokes them. I have found it best to get at the source of the spring or springs, and conduct the water away by large pipes independent of the general system. Confervæ and parasitic plants will also get into the pipes, grow, and ultimately stop the flow of water through them. Another source of trouble is the percolation of sand into the pipes, which necessitates patience and care in taking them up frequently after being first laid, and relaid, until all the water has run out of the bed, and then laying them in straw and on strips of wood. P.

PATENTS.

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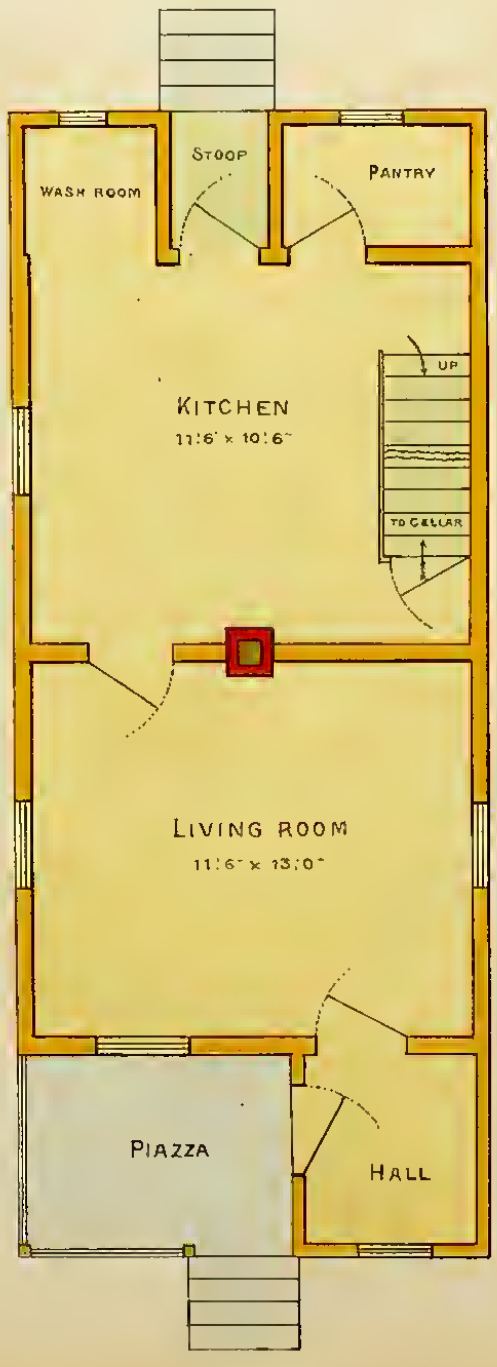
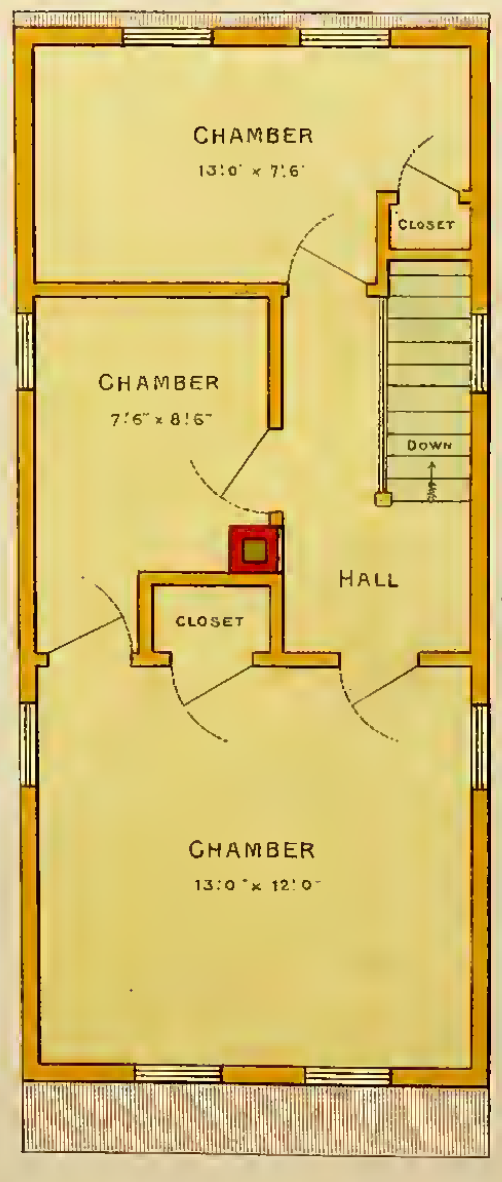
A Twelve Hundred Dollar Cottage

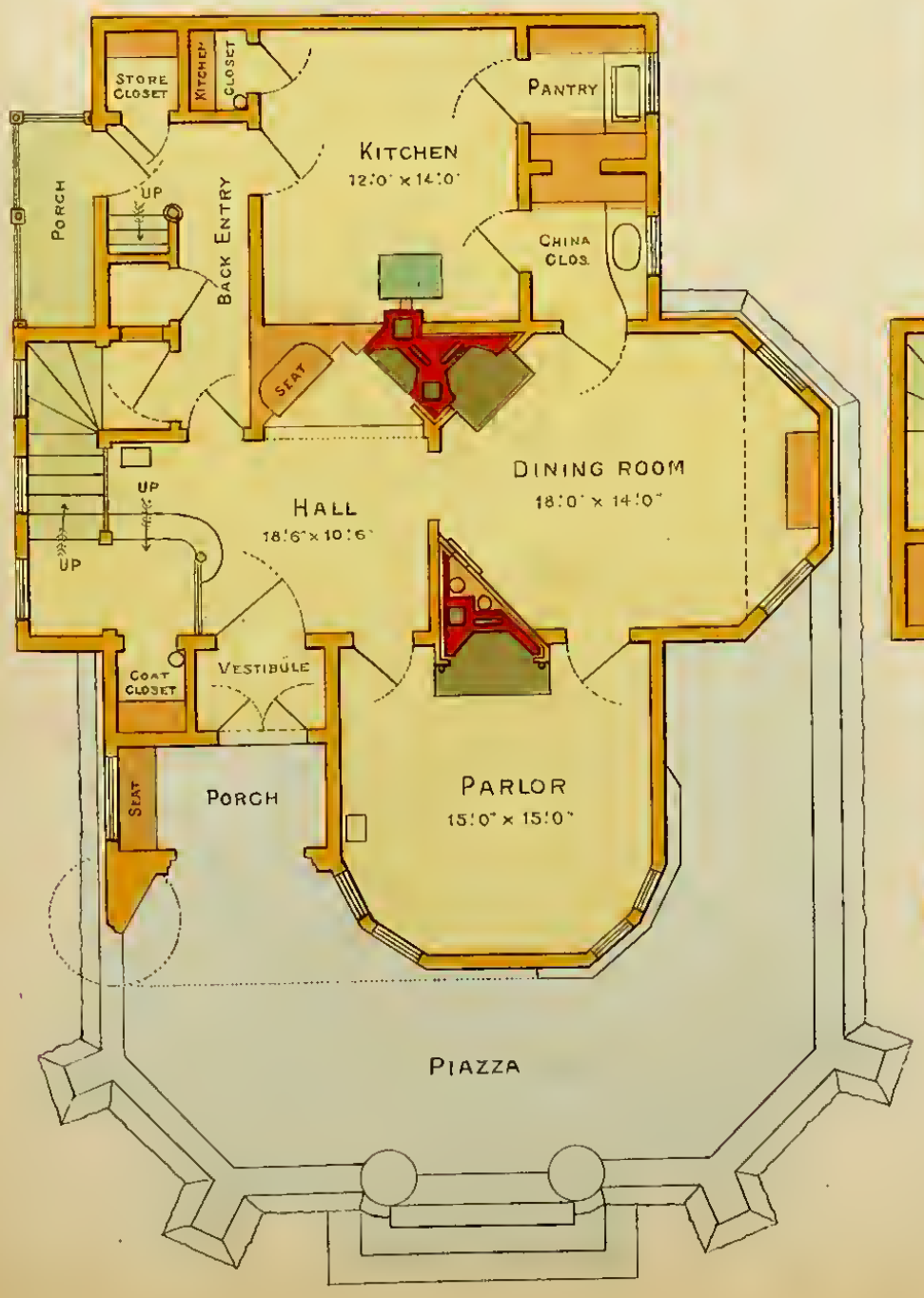
Plan of First Floor.



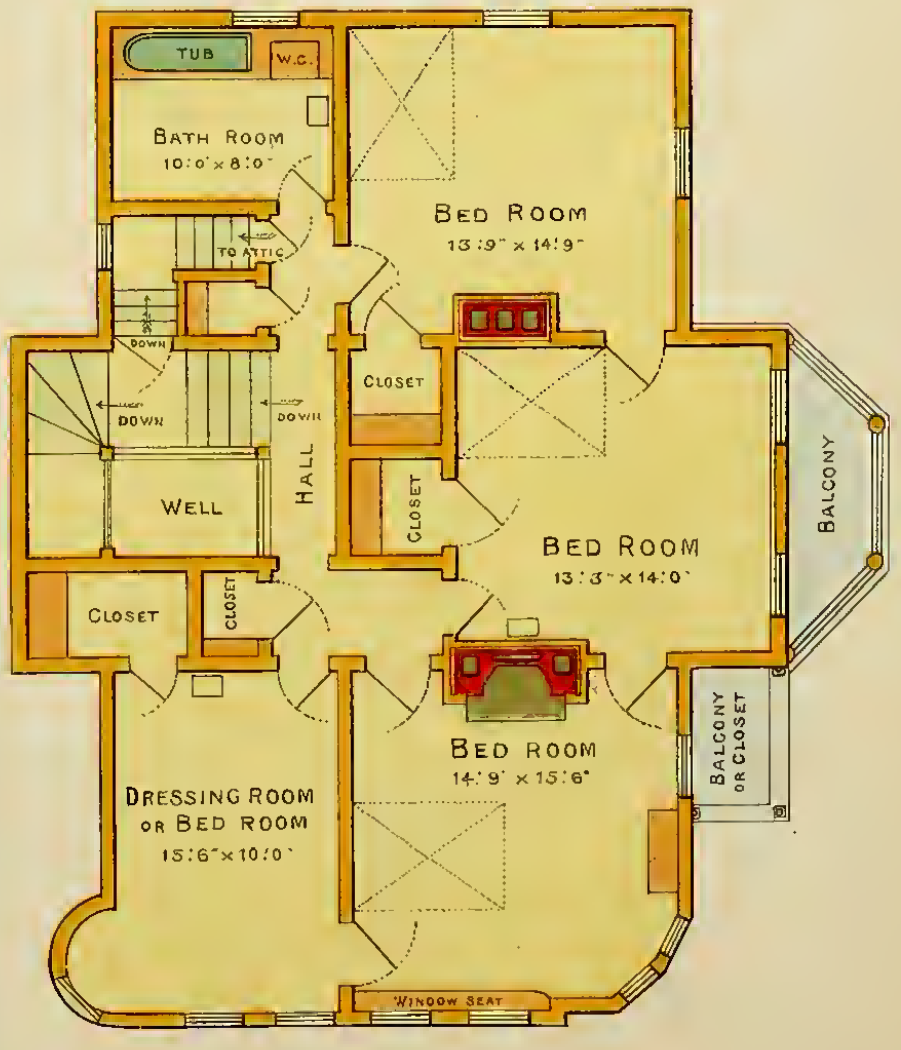


Plan of Second Floor.

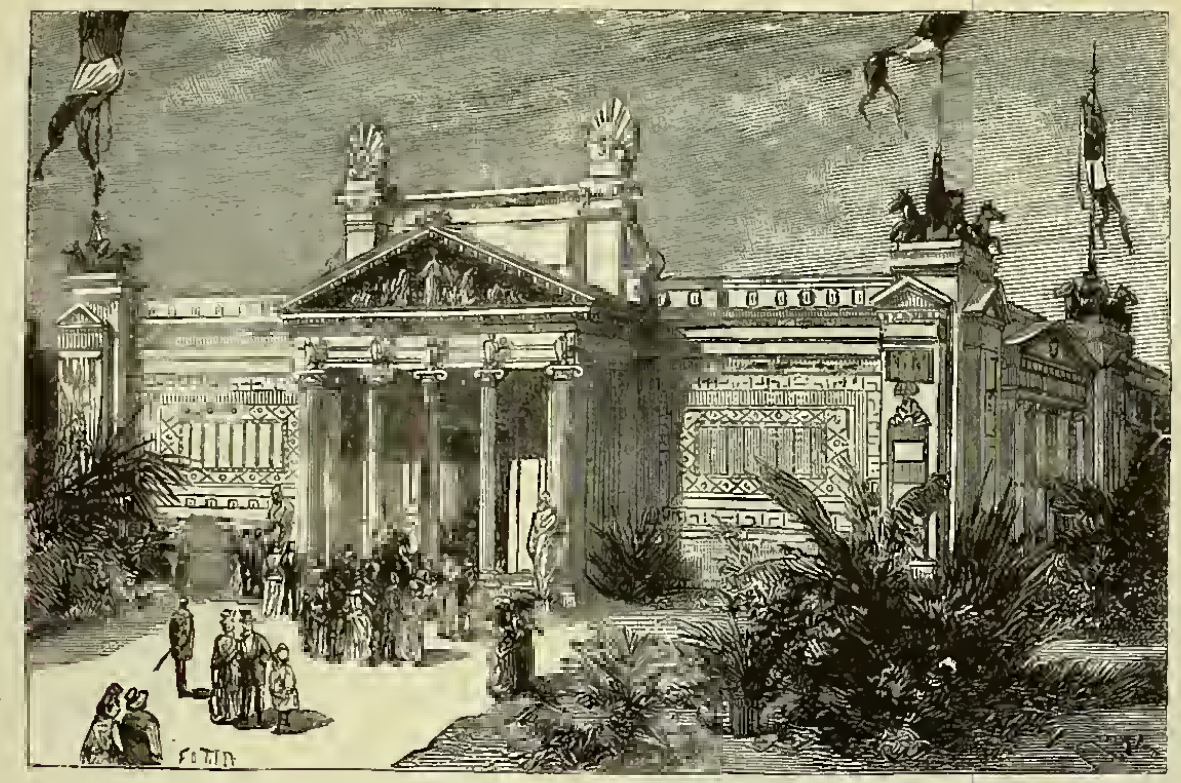
· A · Residence · Costing · Five · Thousand · Dollars ·



Plan of First Floor.

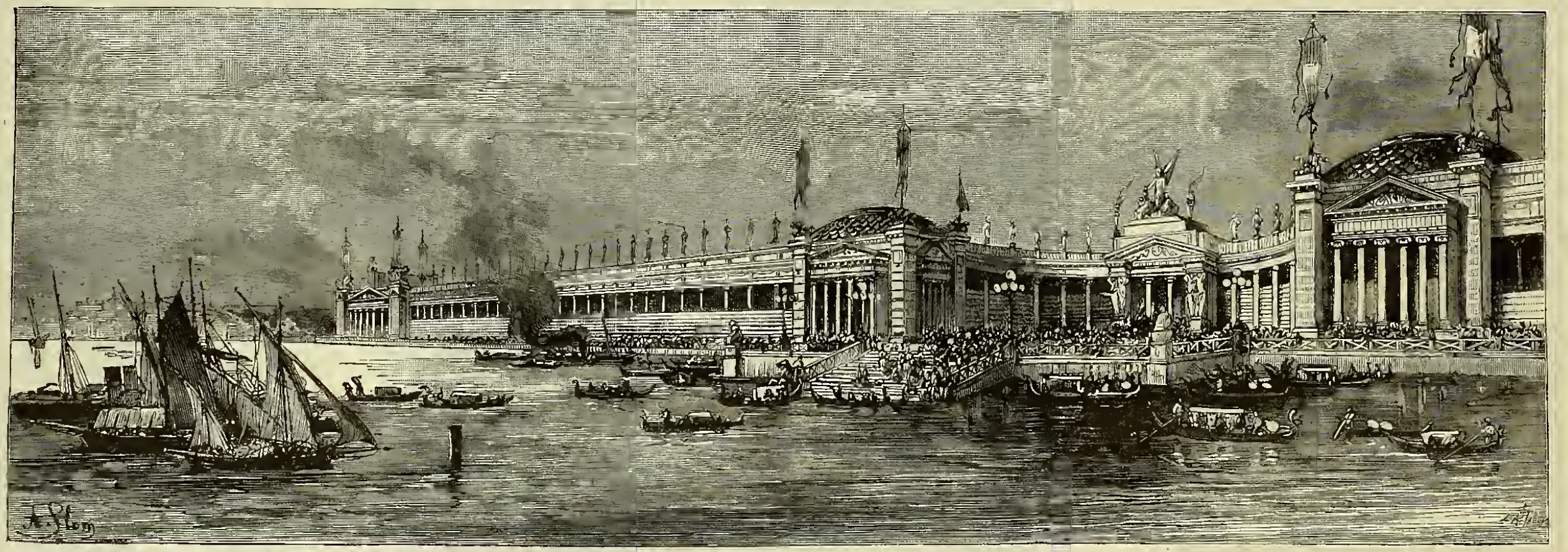


Plan of Second Floor.



Entrance from San Francesco Street.

Cafe of Belvedere.



Principal Front of the Exhibition Palace.

EXHIBITION OF FINE ARTS, VENICE.

WOOTTON.

The residence of Mr. Geo. W. Childs is situated about two miles from Bryn Mawr, a station on the Pennsylvania railroad, and ten miles from Philadelphia. It was at this beautiful place that Mr. Childs so elaborately entertained about 800 of the florists and their friends on the 20th of August last, during the convention of the National society; and as only a small proportion of the florists of America were present on that occasion, it may interest many of our craft to know something of this country seat.

Wootton, as it is now called, was at the time Mr. Childs bought it, in 1880, but a rough farm of about 116 acres. This has been converted into park and garden, with a lawn of thirty-five acres in most perfect keeping, and one of the finest "Queen Anne" country houses to be found in America.

Entering at the lodge, one sees on the left a fine carpet bed containing about 25,000 plants, a very striking feature. Leaving this by a gentle curve in the carriage drive we come to the stables and coach houses, fitted up with all modern improvements, almost in front of which is a fine plant of Abies nobilis, sent as a cutting to Mr. C. by Professor Meehan when with the Hayden exploring expedition in the Rocky mountains. At the rear of the stables, and placed as a facing to a fine grove of natural timber, are some large clumps of miscellaneous plants, very interesting to many visitors, as they contain many things not often seen in this present rage for carpet and other formal styles of bedding. In front of these is a fine stream of running water, which is a great attraction to the whole, and planted on one of the natural curves are some handsome clumps of arundo, rivina, and eulalia. Immediately in the rear of these again is a bed of fancy caladiums, which seemed to luxuriate in the partial shade, and made a happy blending between the natural woods and the dressed lawn in front. Passing on up through this glen we come to a grotto of rocks, through which a small waterfall trickles, and in which it is intended to collect every known variety of fern to be found hardy in North America, all of which will be correctly named. Passing on south from this we strike the open lawn, directly facing the house. Here are dotted among lots of choice trees and shrubbery some fine plants of Picea pungens, retinosporas, Taxus canadensis, pinus in variety, etc., which, for the short time they have been planted, are remarkably thrifty trees. These, as well as other similar classes, are very effectively arranged for future development.

In front of the house stands the magnificent vase illustrated and described in the *Florist* of Nov. 1, and above this, on each side of the steps leading to the front door, stand two grand plants of Cycas revoluta and a fine one of Araucaria bidwilli. In close proximity stands a purple beech planted by Madame Nilsson. On the west side of the house is an effective design planted with coleus and other summer plants.

On the gentle slope northwest of the house are situated most of the memorial trees planted by illustrious visitors to Wootton. These are all to be labeled with botanic names, circumstances of planting, etc., thus giving the collection a sentimental as well as scientific interest for the future visitor. Noticeable among them is a fine piece of Picea nordmanniana planted by Mrs. Nellie Grant Sartoris, and in close companionship a fellow tree and a Quercus palustris and Norway spruce planted by the three daughters of the late F. A. Drexel, all growing into nice trees; but those near by, planted by Thos. Hughes and Herbert Spencer, are both dead, which is much to be regretted. There are on this broad expanse of lawn many other trees planted by men of mark, but their enumeration would take too much space. There is one other, however, which probably would interest all who behold it. Standing close to the lower or farm entrance is probably the finest specimen in the country of Carya porcina (common hickory); stretching away from this is a fine avenue of platanus leading to the farm, dairy, and green houses.

The greenhouses are a fine combination of houses built to suit the various classes of plants required for a well-appointed gentleman's garden, and their contents show the skill of its able superintendent, Mr. John M. Hughes, as do all other parts of this fine place. Among the many other choice attractions of the greenhouse, a fine bench of gloxinias was particularly striking.

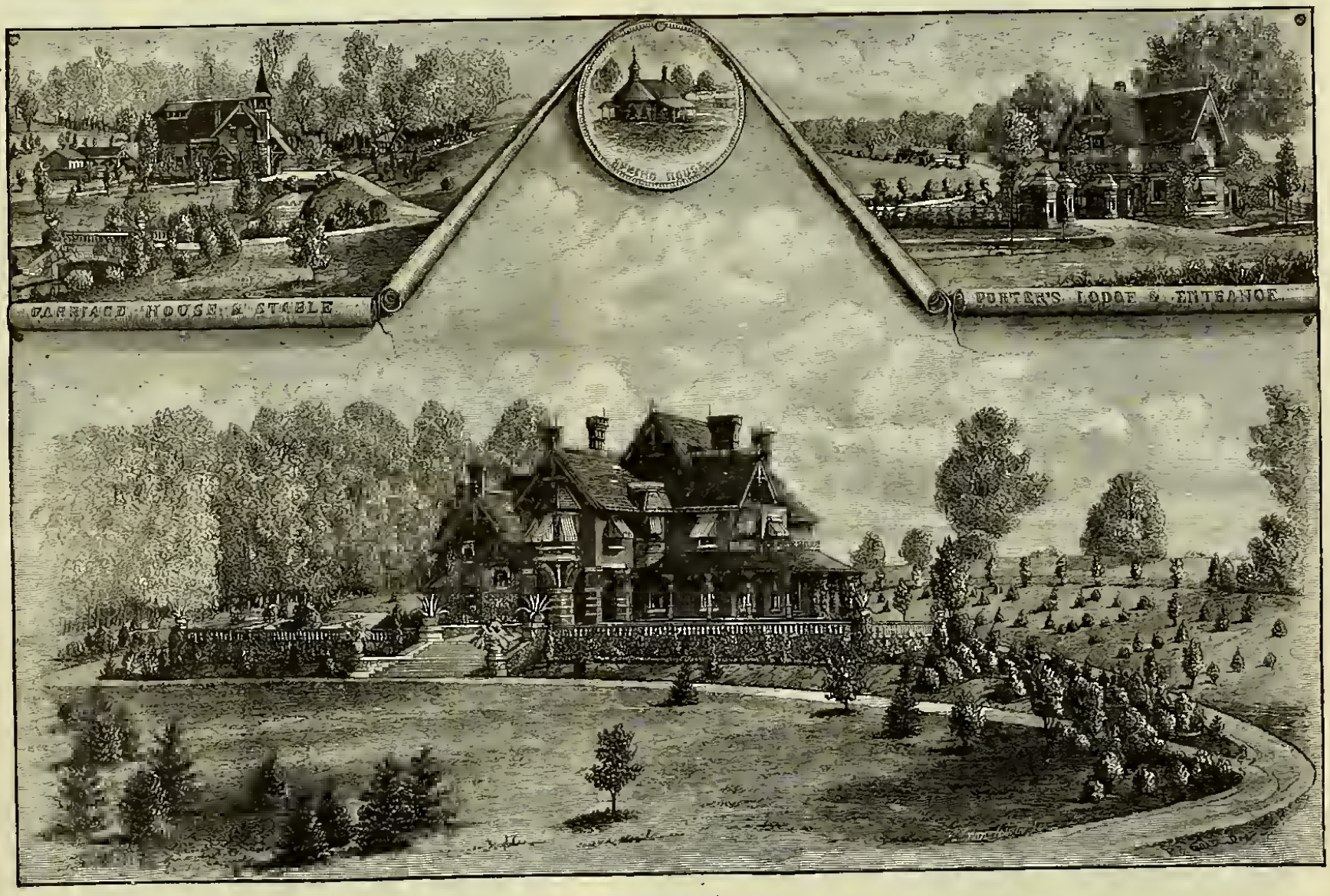
Running at the bottom of the vegetable garden is another fine stream of water, from which is pumped (itself furnishing the power) all the water required for the farm and greenhouses. In the same locality is the dairy, supplied with a constant stream of pure water from a natural spring flowing into a shell presented to Mr. Childs by the late General Grant, and brought by him from Yokohama, Japan. From this shell the water flows gently over beautiful clear white tiling all around the dairy, thus forming a cooler for the milk. Everything is in the most perfect order, and the whole building is unique in every way.

After taking a comprehensive view of this fine place, one is greatly impressed with the splendid results accomplished in the short space of six years. Not only lavish expenditure, but the most refined taste, were requisite for this end, and I only wish that many others with wealth at their command might be induced to become as liberal patrons of horticulture, for by such is our calling elevated and refined. Here the gardener is not treated as a necessary evil, as is often the case, but as a friend and trusted steward, employer and employed mutually considering each other's best interest and happiness.

The accompanying engraving beautifully illustrates the house and part of the lawn near to it, with the fine grove of natural timber in the distance, whose beautiful shade protected the florists and their friends while enjoying the lunch provided by Mr. Childs on the occasion of their visit. But this picture of Wootton, though excellent, does not give a true impression of the harmonious blending of art and nature which is so striking to all visitors. It must be seen to be appreciated.

John N. May.

Summit, N. J. —*Amer. Florist.*



"WOOTTON,"
DELAWARE COUNTY, PENNSYLVANIA.
RESIDENCE OF GEORGE W. CHILDS, Esq.

From Ashmead's History of Delaware County, 1884.

To Transfer Prints to Wood.

The whitewood used being perfectly smooth, should receive a few coats of French polish. The print to be transferred having been dampened with a sponge soaked in spirits of wine, is placed on the wood with a piece of thick cloth over it. A warm iron is then passed gently over the cloth, care being taken not to shift the picture. Keep the iron rubbing backward and forward for ten or fifteen minutes, then take off your cloth and leave it for some hours. Now get some cold water, dampen your finger in it, and rub the paper. Great care must be taken not to distnrb the impression. Keep damping your finger as you go on. When you have got the paper all off, you can polish over. Any kind of print will do which is not glazed. Ink impressions are the most easily transferred.

Tree Growth.

The following figures may interest those of your readers who have paid attention to the growth of trees. I have carefully measured these seven trees annually, and give you the sum of ten years' growth.

	Jan., 1878.		Jan., 1887.	
	ft.	in.	ft.	in.
A sycamore	7	½	7	7½
A cut leaved alder	8	6	9	1½
An oak	10	0	10	7½
A Cryptomeria japonica	2	8¾	4	2
A Spanish chestnut that has been pollarded	13	10	15	5
The above trees are in the garden, the two following in the park:				
A Spanish chestnut	12	7	13	7
Another	8	8	9	5

It will be seen that the Spanish chestnuts grow faster than the other trees, and the pollard the fastest of all. The trees are measured at four feet from the ground.—*Wm. Wickham, Binsted-Wyck, Alton, in the Garden.*

CHURCHES OF MODERATE COST.

We present herewith a couple of sketches of churches of moderate cost, for which we are indebted to our esteemed cotemporary, *Building*. The cost of erection is stated in connection with the engravings.

National Association of Builders of the United States.

The first convention of this important body was held at Chicago, March 29, 1887. A full report of the proceedings was given in the March number of the *Building Budget*. The following is the

DECLARATION OF PRINCIPLES.

1. This association affirms that absolute personal independence of the individual to work or not to work, to employ or not to employ, is a fundamental principle which should never be questioned or assailed. That upon it depends the security of our whole social fabric and business prosperity, and that employers or workmen should be equally interested in its defense and preservation.

While upholding this principle as an essential safeguard for all concerned, this association would appeal to employers in the building trades to recognize that there are many opportunities for good associations of workmen, and, while condemning and opposing improper action upon their part, they should aid and assist them in all just and honorable purposes. That, while upon fundamental principles it would be useless to confer or arbitrate, there are still many points upon which conferences and arbitrations are perfectly right and proper, and that upon such points it is a manifest duty to take advantage of the opportunities afforded by occasions to confer together, to the end that strikes, lockouts, and other disturbances may be prevented. When such conferences are entered into, care should be taken to state clearly in advance that this fundamental principle must be maintained, and that such conferences should only be competent to report results in the form of resolutions of recommendation to the individuals composing the various organizations participating, avoiding all forms of dictatorial authority.

2. That a uniform system of apprenticeship should be adopted by the various mechanical trades.

That manual training schools should be established as a part of the public school system, and that trade night schools should be organized by the various local trade organizations for the benefit and improvement of apprentices.

3. This association earnestly recommends all its affiliated associations to secure as soon as possible the adoption of a system of payment by the hour for all labor performed other than piece work or salary work, and to obtain the co-operation of associations of workmen in this just and equitable arrangement.

4. That all blank forms of contracts for building should be uniform throughout the United States.

That such forms of contract, with the conditions thereof, should be such as will give the builder as well as the owner the protection of his rights such as justice demands.

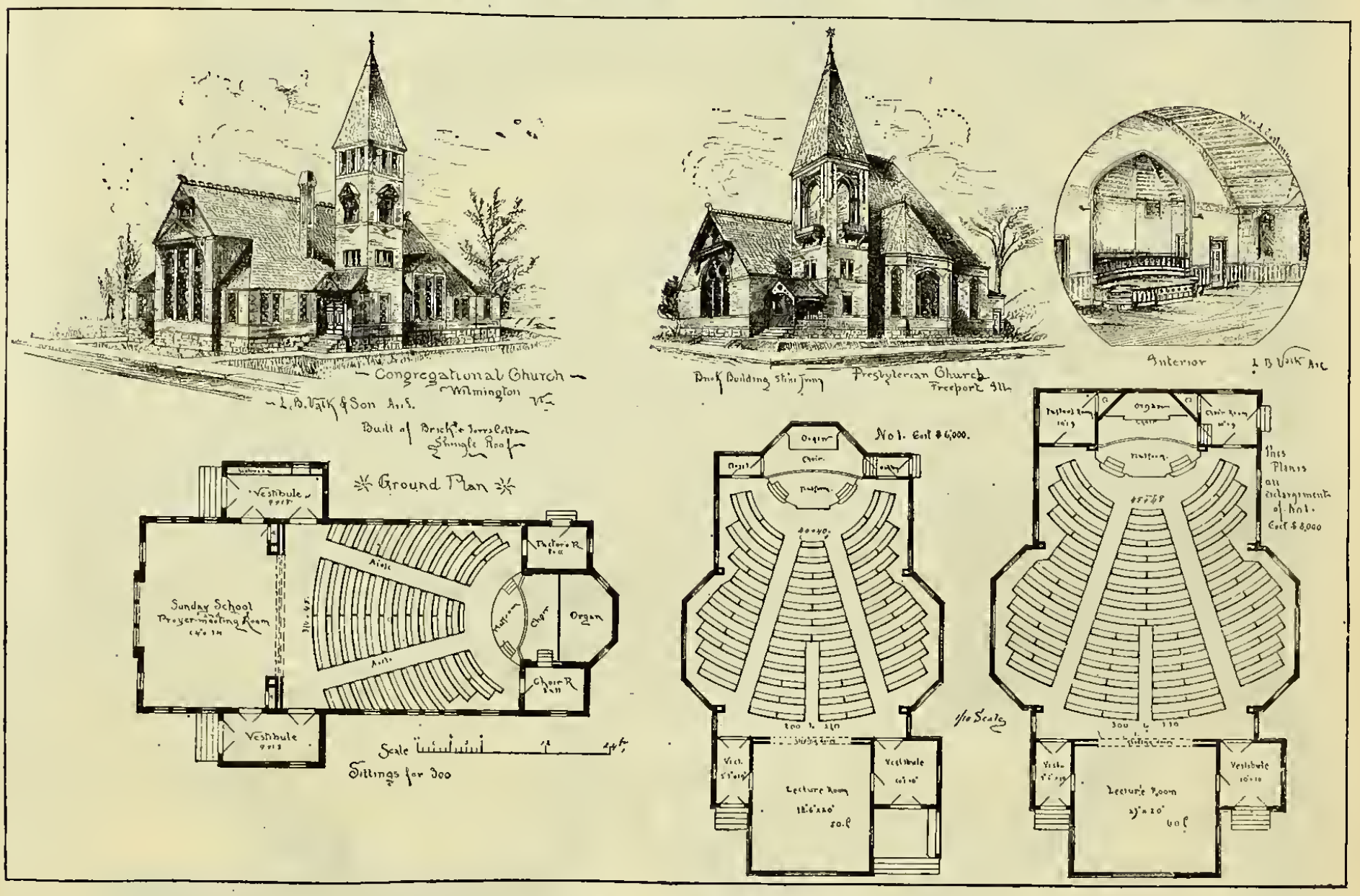
That whenever a proper form has been approved by this association, after consultation with the American Institute of Architects and the Western Association of Architects, we recommend its use by every builder and contractor.

5. The legislatures of the various States should be petitioned to formulate and adopt uniform lien laws, and every organization represented in this association is recommended to use its best endeavors to secure the passage of the same.

6. Architects and builders should be required to adopt more effectual safeguards in buildings in process of construction, so as to lessen the danger to workmen and others.

7. We recommend the adoption of a system of insurance against injury by accident to workmen in the employ of builders wherein the employer may participate in the payment of premiums for the benefit of his employes. Also in securing payment of annuities to workmen who may become permanently disabled through injuries received by accidents or the infirmities of old age.

The next convention is to be held in Cincinnati, on the first Tuesday in February, 1888. The officers for the present year are: President, J. Milton Blair, of Cincinnati; first vice-president, John S. Stevens, of Philadelphia; second vice-president, Edward E. Scribner, of St. Paul; secretary, W. H. Sayward, of Boston; treasurer, John J. Tucker, of New York.



CHURCHES OF MODERATE COST.

The Vast Sums of Money Expended by Builders.

At the recent Chicago convention of American builders, Vice-President Stevens said:

By an examination of the census of 1880, I found that there were in Philadelphia 146,412 dwellings, that they had an average of 5·79 persons to a dwelling. In New Orleans they had 36,347 dwellings, with a percentage of 5·95 persons to a dwelling; in Baltimore, 50,833 dwellings, a percentage of 6·54; in San Francisco, 34,110 dwellings, a percentage of 6·86; in St. Louis, 43,026, a percentage of 8·15; in Chicago, 61,069, a percentage of 8·24; in Boston, 43,944, a percentage of 8·26; in Brooklyn, 62,233, a percentage of 9·11; in Cincinnati, 28,017, a percentage of 9·11; in New York, 73,684, a percentage of 16·37. Now that is a matter of interest.

I then went to our building inspectors to ascertain what had been done in that line for the past six years. I found by an examination of our records that there had been 38,084 building operations, and of these 24,672 were dwellings, which, added to the previous number, makes a total at the first of the present year of 171,084 dwellings in Philadelphia.

I then inquired of our building inspectors as to the value of these building operations. I learned that each one of these comprised a single operation. A large store which we had built there, and which cost $300,000, was a single operation. Each of our churches, some of them costing $150,000 to $200,000, was a single operation. Some of our dwelling houses, costing $75,000 or $100,000, was a single operation. Our factories and our storehouses, ranging in cost from $25,000 to $100,000, were single operations, and so on, down to the humble home of the mechanic, costing possibly $1,000 to $1,200. They assured me that $6,000 for each operation would be a fair average. The figures startled me, and I said: "No; I cannot go away from here with a statement of that kind. I will put it $5,000. You are certainly far above the absolute facts."

Now, $5,000 for each one of those operations makes a sum of over $30,000,000 that is received and expended in a year by the mechanics of Philadelphia. Gentlemen, if we spend $30,000,000 in Philadelphia, what is spent in New York? What is spent in Boston? How much money is expended in Chicago? in San Francisco? in St. Paul? in New Orleans—all over this great country? Gentlemen, $750,000,000 would be a low estimate of the amount of money that is expended by the mechanics who are represented here in convention. Think of it! A sum of money that will exceed the amount which is expended in many of our commercial exchanges, in our boards of trade, among our merchants and our bankers, and we want the public to know it. We want them to respect us, and we want to respect ourselves. [Applause.] If these few words will make any of you go home from here feeling that you can lift yourselves up in your manhood, and feel that standing alongside of the professional man, or the storekeeper, or the merchant, you are part and parcel of the interests of this country, representing a business which exceeds in magnitude that which he represents, it will give you that much more self-respect, and you will receive respect from others in accordance with what you consider of yourselves. [Applause.]

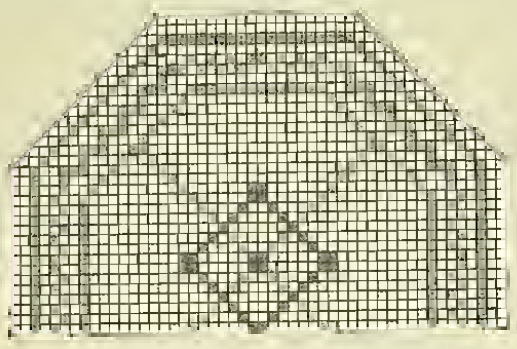
Earthen Drains.

I have never found one solitary case of an earthen drain that was properly laid. And Col. Waring states that in Memphis, where there has been every opportunity and every reason to lay the sewers as perfectly as possible, they found, when they were taken up, that the joints leaked.—*C. F. Wingate.*

END WOOD FLOORING.

Correct notions of health and improved taste have conspired in recent years to bring about a notable change in floor coverings in American houses. Almost without exception, dwellings of the better class now exhibit a sparing use of dusty carpets and a profusion of healthful and cleanly hard wood floors. This tendency has naturally incited invention, and within a decade many new varieties of wooden flooring have been introduced. Some were thick—parquetry; some were thin—wood carpet; but all or nearly all have held to the old method of laying, that is to say, with the side of the grain as the wearing surface.

A little over five years ago, a method of joining wood

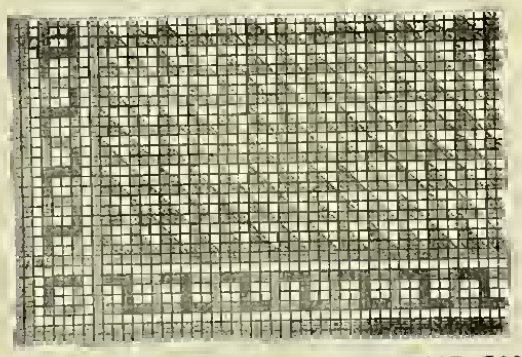


BAY WINDOW OR OCTAGON ROOM.

by molten metal was patented to an American inventor. The first and so far principal application of this method was in the construction of end wood flooring. This consists of pieces of various woods securely joined by metallic or wooden splines and *set on end* in such a manner that the end of the grain becomes the wearing surface.

In the application of joining by molten metal, the blocks of wood are first made as dry as possible, since the presence of even a small quantity of moisture causes the generation of steam when the hot lead is forced into the grooves. The blocks are then jointed to exact size, grooved, assembled into sections sixteen inches square, and showing any desired design by the necessary color selection, and finally joined into a solid section by the introduction of lead made fluid by the requisite temperature.

A more recent invention is a method of joining by

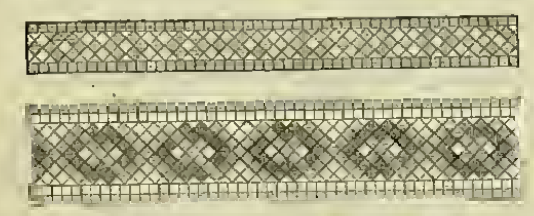


END WOOD FLOORING FOR RECTANGULAR ROOM.

wooden splines after the blocks have been subjected to the same process of drying, jointing, and grooving.

Of the extreme durability of end wood there can be no question. End wood floors in elevator cars subjected to constant wear for over three years still show no signs of loss in thickness, whereas side wood floors, under the same conditions, are found to wear through in a relatively short time. This statement is made on the authority of one of the largest manufacturers of elevators in the country, one who has over ninety end wood floors now in use.

Of the relative beauty of end wood and side wood there might naturally be doubt until the former had been seen. It is frankly admitted that certain pleasing effects are sacrificed by placing wood on end, just as in common quarter-sawed oak you lose one form of beauty and gain another, and with this the further advantage of greater durability and lessened danger



BORDERS IN END WOOD FLOORING.

from shrinkage and warping. So in end wood, unexpected beauties appear, which are no less in degree, though different in kind. Indeed, the beauties of end wood are so novel and so striking that even experts in woodwork marvel at the fact that these were never discovered before. Nearly all the hard woods in common use show beautiful variegations in color, bringing out in some the medullary rays which are otherwise rarely seen except in quartered oak, and exhibiting in all a richer, warmer tone than that shown by the same woods when the side of the grain is exposed.

But probably the greatest merit of all consists in the ease with which end wood floors are kept in order. There has certainly been considerable complaint by housekeepers about the difficulty of keeping hardwood floors in good condition. The fault doubtless lies, in many cases, in want of care and skill. In more cases, however, the complaints are well founded. Side wood floors, with even moderate wear, show such deep indentations from heel nails and furniture, that their original beauty is soon marred or wholly destroyed. End wood, on the other hand, will bear much rough usage, and still retain its perfection of surface, or be restored thereto with little labor.

The principles involved in the construction of end wood flooring, and especially in manufacturing it on a scale so extensive as to make it a practicable industry, were so novel and complex that its development has been slow. Gradually, and in the face of many opposing forces, it has grown into perfection and into public favor. There are now few States in the Union without samples of the work in actual use. Recently two floors were shipped to Greece for the new American school for classical studies in Athens.

This material is manufactured by Wood Mosaic Co., whose works are located on the N. Y. C. & H. R. R.R. in Rochester, N. Y. Their salesroom has now been for about two years at 321 Fifth Avenue, New York City. Here a large display of samples can be seen, and best of all, a floor subjected to hard usage and designed to give practical demonstration of the qualities which they claim for it.

We ought to add that the first cost of end wood mosaic hardly exceeds the cost of thick parquetry of the old style, hence its greater durability makes it in the long run more economical than any other.

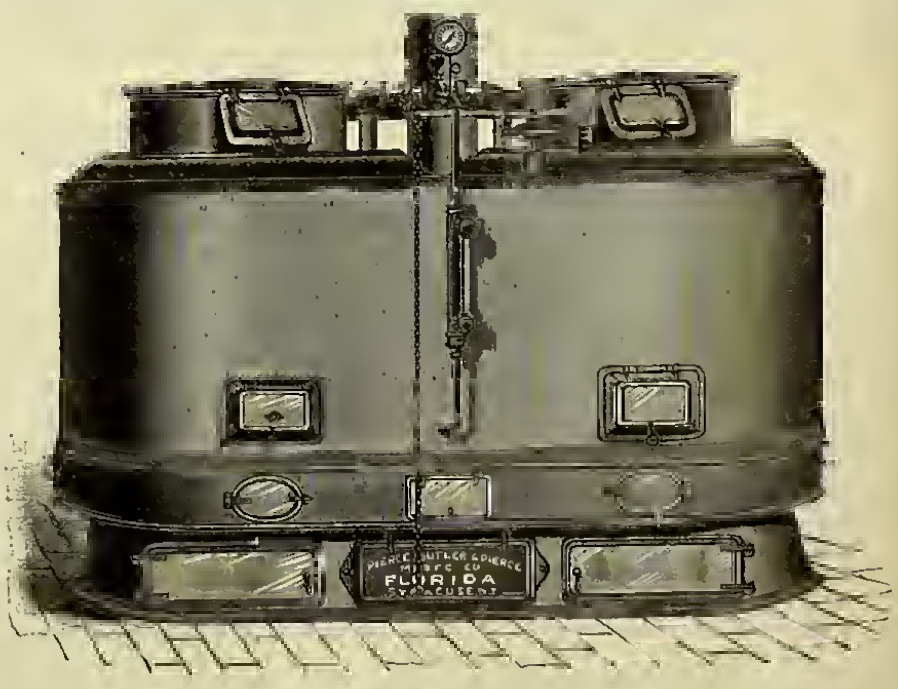
THE FLORIDA STEAM HEATER.

There are at the present time so many heaters of various kinds upon the market that the selection of the most serviceable and economical system often becomes a matter of no inconsiderable trouble and difficulty. A careful consideration of the advantages claimed for the Florida steam heater, made by the Pierce, Butler & Pierce Manufacturing Co., of 14, 16, and 18 Clinton Street, Syracuse, N. Y., is recommended before making a decision.

This firm manufactures these heaters in a variety of sizes, and for all purposes. The one illustrated in the engraving is of an extra large size, and is designed to meet the popular demand for an economical steam heater of sufficient capacity for warming public buildings, churches, schools, apartment houses, and other buildings of large extent. In it the parts are so arranged that two fire pots, two grates, and two self-feeding fuel magazines are operated, either separately or together, as may be required. In cold weather both fires are run, and in mild weather one fire is allowed to smoulder or entirely go out, with a corresponding reduction in the amount of heat generated and in the consumption of fuel. The great difficulty in large apparatus of reducing the heat without waste is thus accomplished in a very simple and satisfactory manner.

Small heaters for private residences and other purposes are manufactured, the characteristics of all the heaters being that they are not made of common cast iron, but of a carefully mixed composition of ores, which combines the maximum of durability with the quality of transmitting the heat in the greatest degree.

The construction of the Florida steam heater may be briefly stated to consist of three or more hollow cast iron water sections of circular form, with six oval shaped return flues, and three waterway openings cast in each. These openings in the sections, when set up, come in line and form the perpendicular return flues of the heater, as well as the steam communication between the sections. The construction has many other points of great advantage, to which we have not now space to refer.

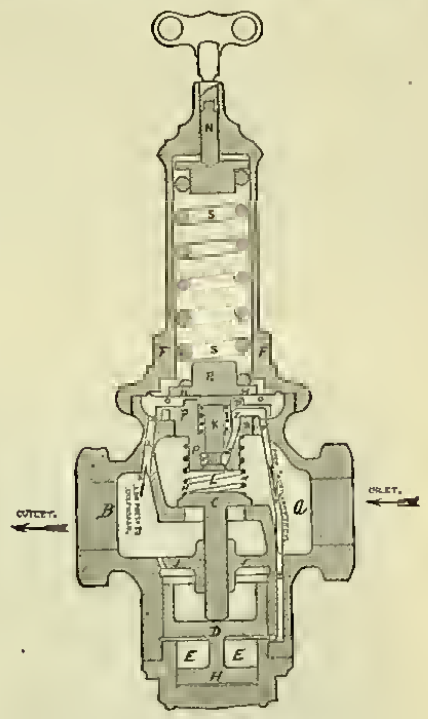


THE FLORIDA STEAM HEATER.

Among the advantages claimed for the heaters may be mentioned these: That it is cheaper, requiring no brickwork; it is sectional and easily handled; it is self-feeding or surface burning; it takes up less space in the cellar, being portable; it will carry steam in the coldest weather continuously from twelve to eighteen hours without attention; and last, but by no means least, it is the most economical of fuel of any heater extant.

THE MASON REDUCING VALVE.

In the many positions where it is desired to use a lower pressure than that of the boiler, such, for instance, as for steam heating coils, dry rooms, paper making machinery, etc., the Mason valve will prove of great service in automatically reducing and maintaining an even steam or air pressure, regardless of the initial pressure. They are made in various sizes, up to and including two inch, of the best composition, and above that size of cast iron, with composition lining. The construction of the valve will be sufficiently obvious on reference to the sectional view represented in the accompanying engraving. It will be seen that the



THE MASON REDUCING VALVE.

arrangement of parts is well calculated to do the work thoroughly and efficiently.

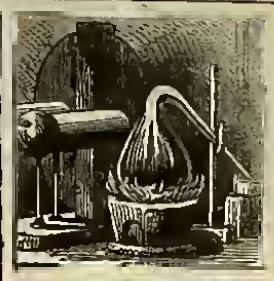
The Mason Regulator Co., of 22 Central Street, Boston, are the manufacturers.

The N. Y. Central Iron Works.

The extensive manufactory of W. B. Dunning, at Geneva, N. Y., which is known as the New York Central Iron Works, is now turning out a large amount of material. Steam engines and boilers of all kinds, from 1 to 150 horse power, machinery, castings in iron and brass, and a very extensive set of steam heating boilers are among the manufactures turned out from this busy and thriving works. Of the number of these last is the patent portable base burning steam heating boiler, an excellent apparatus, having many advantages, which are of so decided a nature that it has been exported on order to England, Germany, Belgium, and even so far as Tokio, Japan.

The reputation of Mr. Dunning as a mechanic and manufacturer has grown during nearly half a century, and the excellent quality of his workmanship and materials is only equaled by the ingenuity of his many improved methods of construction.

To clean chamois leather, rub into it plenty of soft soap, and then lay it for two hours in a weak solution of soda and warm water. Afterward rub till quite clean, rinsing in clean warm water in which soda and yellow soap have been dissolved. Wring dry in a rough towel, pull out, and brush.



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II. A $1,000 cottage. A $1,400 double house. With plate of details drawn to a scale. August.

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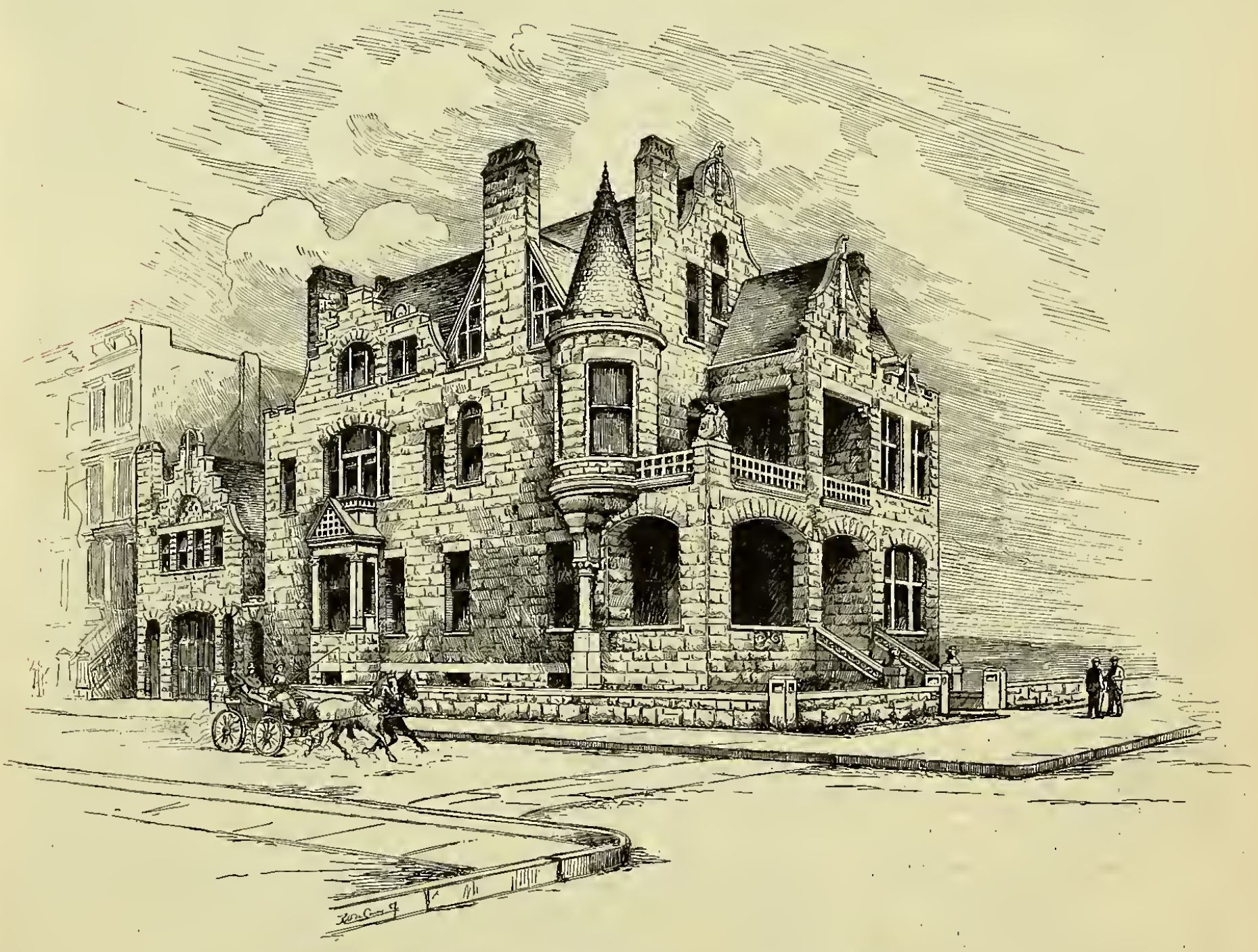

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A DWELLING AT MONTCLAIR, N. J.

SPECIFICATIONS AND DRAWINGS.

The specifications and drawings are intended to cooperate, so that any work shown on the drawings and not mentioned in the specifications, or *vice versa*, is to be executed the same as if mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever. The drawings taken in connection with this specification are intended to provide for the completion of the entire carpenter work, mason work, painting, plumbing, tinning, etc., and everything mentioned in this specification.

DESCRIPTION OF WORK.

All work throughout to be done in good, substantial and workmanlike manner, and to the satisfaction of the owner or his agent.

Timber.—All the timber to be good, sound hemlock, free from all bad defects, and as well seasoned as the market will afford.

Sills, 3" × 8"; posts, 4" × 6"; interties, plates, etc., 4" × 4"; first and second tier of beams, 2" × 10"; partition plates, 4" × 4"; studding, 3" × 4"; main rafters, 2" × 8"; ridge pieces, 2" × 10"; piazza sills and bearing timbers, 3" × 8"; piazza beams, 2" × 8"; piazza rafters, 2" × 8"; collar beams, 2" × 10" × 24" on centers; beams under tank to be made extra strong.

Lumber.—All the lumber throughout to be of well seasoned clear white pine, except where otherwise specified.

Framing.—Sills to be halved at angles and corner and well spiked. Size floor beams on sill and spike well thereto; size second story beams on ties; post to have tenon on top to receive plate. Tenon all the studs on top and neatly fit on bottom. Double all beams for trimmers and headers; double all beams running parallel with partitions. Double all window and door studs, including heads. First and second story beams, 16" on centers, all rafters 24" on centers, porch floor beams 20" on centers. Fit main rafters neatly to plate, mortise and tenon all headers and trimmers.

Siding.—Cover the entire vertical sides, except where otherwise shown, with clear 6" Michigan strips, not less than ⅞ lap, and nailed with 6d. nails, not more than 6" apart, and set nails for putty.

Cornice.—Form cornice as shown on the plans, with fascia and moulding as shown, all as per details

Gutters.—Form gutters on roof, line, and give proper cant to run water.

Shingling.—Shingle where shown on plans with 18" pine shingles, laid not more than 5" to the weather. The starting course to be rounded on the bottom; all the rest plain and straight.

Corner and Angle Boards.—All the corner boards to be 1¼" × 5"; angle boards, 1¼" × 3½".

Water Table.—Run water table around the entire house, except where piazza comes; first member, 1¼ × 4", with wide member at bottom, all as per details.

Window Frames.—Make window frames in usual way, for double hung sash pulley stiles, 1¼; hanging stiles, 1¼ × 5; 2" main sill; 1½" rabbeted sub sill, stops and parting strips complete.

Door Frames.—Make door frames in the regular way; rabbeted jambs 1¼ thick; outside casings, 1¼ × 5"; 2" main sill.

Piazza, Cornice, Rails, Columns, etc.—Piazza plates to be 6" × 8", made of 1¼ lumber, and a timber inserted for strength; form cornice same as main house cornice and as per details. Form the piazza rail as shown on the plans and as per details. Rail to be 4 × 3, moulded; bottom to be 3 × 4, moulded; columns to be 6 × 6, turned in center and square at each end; balusters for piazza, 1¼" × 2", beaded edges.

Piazza and Stoop Floors, etc.—Lay the piazza and stoop floors with 3" × 1" narrow pine flooring, tongued and grooved and laid in white lead joints; this flooring to be clear and perfectly dry, all to be blind nailed and all bead joints smoothed off: all to have proper cant from house to nosing finish; fascias, 9" wide.

Stoops, Lattice, Cellar Door, etc.—Put down all necessary steps to all stoops as shown on the plans; 1¼" strings; 1¼" treads; and ⅞ risers. Treads 11" wide. Coil up on sides of stoop strings. All steps to have nosing and cove finish. The front stoop to have bulkheads.

Brackets.—Furnish all brackets as shown.

Overhanging Floors.—All the overhanging floors to be deafened with rough hemlock boards, cut in between the beams at least 3" down, and this space filled in with mortar.

Sashes, Blinds, etc.—All the sashes for first and second and loft stories to be 1½ thick; made of clear, soft pine, and number of lights as shown. Outside rolling blinds on first and second stories.

First Story Floors.—The first story floors will be laid with sound, white pine flooring. All to be blind nailed to each and every beam. All heading joints smoothed off. Second story floor to be same as first. Attic to be 9½" wide flooring.

Bridging Beams, Partitions, etc.—Bridge all the floor beams once between their bearings with 2 × 2 bridging, nailed at each end. Bridge all partitions once in their height with 2 × 4, straight and well nailed.

Tin Work.—Line all the gutters and valleys with the best I. C. charcoal tin, 20" wide, well nailed and soldered. Tin all flats. Furnish and put in all necessary flashing of every description.

Leaders.—Furnish and put up all necessary 3 leaders to convey water to ground where directed.

Slating.—Slate the whole entire roof with 16 × 8 black slate, not less than 3" lap.

Doors.—For sizes and number see plans. The front door will be 2" thick, and made as shown on the elevation, with heavy raised moulding on the outside and flush moulding on the inside to match other doors. Folding doors 2" thick, four paneled, and flush moulding. All other room doors first and second stories to be 1½" thick, closet doors to be 1¼". 1½" doors double faced, 1¼" single faced, all to be four paneled and flush moulded. Those for rooms, 1½"; closets, 1¼". All these doors to be blind tenoned and perfectly dry and clear for wood filling for door to have head light over.

Jambs and Saddles.—All the door jambs throughout to be 1¼" rabbeted. All doors that swing, to have four and a half inch hard wood saddles. All hearths to have hard wood hearth borders. All doors, where needed, to have rubber tipped stops.

Bases and Wainscoting.—All the rooms and halls in the first and second stories, except bath room, to have 7½ base with moulding on top; closets to have 5" beaded base. Wainscot bath room 2' above the fittings all around; this wainscot to be of yellow pine.

Closets, Pantries, etc.—The butler's pantry will be fitted as marked on the plans. Five shelves high; shelves 14" wide and to be supported with cleats all around. Shelves supported on turned columns. All the second story closets to have two shelves, each supported on cleats all around and hanging strips underneath with hooks. All these shelves to have beaded edges. Also build and shelve dressers as shown on first story plan.

Stairs.—Build main stairs from first to third story of clear, dry pine, 1½" treads, ⅞" risers, 1¼" strings, both strings to be housed out. All the treads and risers to be wedged with glue. The front string to be moulded as will be shown on details. Treads to have nosing and cove finish. The balustrade on these stairs will be yellow pine rail 2½ × 3½. Intermediate newels 4 × 4, with head and drops, chamfered, reeded, etc.; rail to be moulded. Balusters 2 × 2, square and turned, etc.; all as shown. All these stairs will be well supported and furred and ready for lathing. Stairs from second story to loft to be plain box stairs. Build cellar stairs as shown, 2 × 10 spruce strings, 1¼" spruce treads, no risers.

Architraves.—The trimmings for principal part of first story will be 4½ casings reeded and moulded as per detail, with wall moulding to miter with base moulding. Second story, kitchen, pantry, etc., will have 4½" casings, moulded as per details. Closet to have 4" plain casings. Window casings to match those of door, with stop beads complete. All the interior woodwork throughout, including doors and stairs, to be white pine.

Stools, etc.—All windows to have neat moulded stools with apron.

Corner Beads.—Furnish and put on corner beads to all exposed plaster corners

Grounds, Furring, and Cutting.—Furnish and set grounds to all doors for the mason to finish his work. Do all furring of every kind. Do all necessary cutting for plumbers, gas fitters, and other trades.

Sash Weights and Cords.—All double hung sash to have cast weights and Italian sash cords.

Glass, Glazing, etc.—All the glass on first and second stories to have second quality, single thick French sheet glass. All this glass will be puttied in and well tinned, and the glass washed off immediately after the putty is put in. This glass must oe protected from injury by the mason.

Hardware.—All the doors on the principal part of the first story to be hung on 4×4 lacquered plain butts, second story and kitchen to have 3½ × 3½ imitation bronze butts. Front doors to have three butts each. Principal part of first story to have jet and bronze knobs and bronze drop escutcheons. Second story to have lava knobs and roses and drop escutcheons. All rooms throughout to have brass faced mortise locks, city made. All closets to have reversed rim locks. Front doors to have heavy front door lock, night latch attachments and bronze knob outside; brass flush bolt top and bottom; the principal part of first story to have the Daisy sash lock with bronze tip, others plain tip. Furnish all necessary drawer pulls, cellar bolts and hooks, bolts, etc; all necessary hardware for bath room and pantries, etc.; in fact, all necessary to complete the job.

Mantels.—Contractor will set the mantels, but owner will furnish same.

Fit up bath room in ash, inclose wash bowl, set tub, furnish top to tub, fit up water closet with riser, seat, and lid, all complete. Furnish and set two wash tubs with covers, tubs made out of 1½ perfectly clear and dry lumber. Set up on turned legs.

Ceil the piazza with narrow ceiling, beaded, part on rake and part on level.

Furnish and put all necessary pipe boards for the plumber to screw his pipes to.

Contractor will set wood mantels.

Privy.—Build privy where directed, of wide ceiling boards, planed on two sides. Small cornice shingle roof, panel door. Small sash and holes with covers complete.

MASON'S SPECIFICATION.

Excavation.—Excavate for all piers and foundations 2' 6" deep. All earth and rubbish to be removed where directed. All water that may accumulate during the excavation, from any cause whatsoever, will be removed at once and the premises kept dry.

Brickwork.—The cellar walls to be of hard burnt brick, 8" thick from bottom to top, started on a solid concrete footing course, laid up straight and level, headers every seventh course, to be good strong cement mortar, and to the height as shown on the plans, which is 7' in the clear. The joints to he struck. Leave holes in wall where directed for soil, gas and water pipes. All angles and corners to be perfectly plumb and the wall level on top. The brickwork to run to top of beams

Brick Piers.—Build brick piers where shown on the plans, of good hard burnt brick, size and number as shown on plans. All piers to be excavated for at least 2' 6" deep, and filled in with small stone and well hammered down to a solid bed. Cement the whole entire cellar bottom 3" thick with screened gravel and Rosendale cement, 3 parts gravel, 1 part cement, left perfectly smooth on top.

Chimneys, Flues, etc.—Build chimneys as shown on plans, of good hard burnt brick, the joints of all flues struck smooth and capped as shown. The fireplaces in dining room, parlor, hall, and library room will he built of selected brick, arched on top, and as will he directed; the hearth of same to be tile, to cost twenty-five cents per square foot, without the cost of laying.

Cesspool.—Build and excavate cesspool where directed, 60' from house, 8' × 8' in the clear, laid up with brick and domed over on top, covered with flat stone.

Drain Pipe.—Run 4" drain tile from inside of cellar wall to cesspool. Build privy vault 4' deep, walled up with brick, 8" smaller each way than privy frame, laid up dry. This vault to project 2' in clear of rear of privy.

Cistern.—Build cistern in rear of house, 12' in diameter by 13' deep, laid up with brick laid on flat in cement mortar, domed over on top, and have manhole covered with flat stone or iron cover. Cement the entire inside with strong cement and put flat stone at bottom for water to strike against.

Tiling.—Run a line of 4" drain tile from leaders to cisterns, with the joints well cemented.

Plastering.—The first and second stories, including all closets and soffits of attic stairs, to be lathed and plastered three coat work, last coat to be hard finish, gauged high The attic closets may be laid on, the mortar to lie at least one week before using.

The mason will make all his work good, after all the other trades are done, and leave the building broom clean immediately after the plastering is done. This specification is intended to cover all mason work to fit the building ready for occupancy as per plan, but should anything have been omitted necessary to that end, it must be done without extra charge.

PAINTING.

All the exterior woodwork usually painted, including privy and blinds, to be painted two good coats of H. W. Johns' asbestos mixed paint, all knots and sap to be well shellacked before priming, all cracks, joints, and nail holes and over nail heads to be well puttied after priming is done, all tin work to have two coats. Also paint the chimneys two coats, all the colors to be selected by numbers from the card of colors. The interior will be finished with David B. Crockett's wood preservatives. Give the wood one coat, let stand twenty-four hours, then another coat, and rub down with curled hair or like material. Putty to match color of the wood. All the door saddles, hearth borders and hard floors to be finished in same manner. The painting must follow immediately after the carpenters.

PLUMBER'S SPECIFICATION.

Drain.—Furnish and put in where shown on the plans a 5" cast iron drain pipe to run from inside of building out to the tile drain, 4' outside of the building. Use Y branches for all iron pipe connections.

Soil.—Furnish and connect with the drain in cellar a 5" cast iron soil pipe, and run same size up and out of roof at least 4' above highest point, and cap the same with the "Smith" patent ventilating cap. Use Y branches for all waste connections. All the iron soil pipe to have a coat of asphaltum. The soil pipe to have a cleaning out cap in cellar.

Calking.—All joints of all iron pipes are to be thoroughly calked with picked oakum and molten lead and screwed in position with iron hooks. All joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipes and lead pipes soldered to it with wiped joints.

Boiler.—Furnish and put up, where shown on plans, a 40 gallon round head heavy pressure copper boiler, and provide with draw cock for emptying the boiler, and shut-off cocks, for shutting the water off from the second story, and provide with circulating pipes complete, connect boiler draw cock with the sink waste, have a ⅝" stop cock on supply pipe and combined safe and vacuum valve on top of boiler. Boiler to be supplied with a "Lockwood" stand.

Supply.—Tap and pay for tapping the water main, and connect a ⅝ *aaa* supply, and run to the boiler. Supply to have a shut-off cock inside the cellar wall. All pipes are to be graded so they will drain perfectly dry, each floor to be controlled separately by shut-off cock. Where pipes will not drain dry, put in a small pet cock.

Sink.—To be a Mott's Eastlake galvanized, with back air chamber, and iron legs. Furnish and set up where shown in the kitchen an 18×30 sink, and supply with hot and cold water through ⅝" *aaa* lead pipe and Fuller cocks, and to have 1½" C lead waste pipe, properly tapped and connected with the drain, with a 2" iron pipe to the main soil pipe. To have a cleaning cap on end of pipe under sink.

Bath.—Furnish and put up where shown a 16 oz. sheet copper bath tub 4½' long, well tinned and planished. Supply with hot and cold water through ⅝ *aaa* lead pipe and nickel plated combination bath cock with rubber spray, to have 1½" C waste and be properly tapped and connected with the soil. Bath to have nickel plated plug and chain. Overflow to be connected with waste.

Bowl.—Furnish and set where shown on the plans a 14' marble Italian ware wash bowl, with marble countersunk top and surbases 10" high; supply with hot and cold water through ½" *aaa* lead pipe and nickel plated Fuller patented basin cocks, to have 1½" C lead waste properly tapped and connected with the soil, to have nickel plated chain and stay and plug.

Cocks.—No cocks to be placed at the end of a line, but the pipe extended so as to prevent jarring directly on cock

Closet.—Furnish and set in the bath room, where shown on plans, supplied with water through 1¼" pipe from cistern above, an "Inodoro" porcelain wash out closet, with suitable size cistern. The cistern to have the flush tank attached, supplied through ⅝ *aaa* pipe and have cistern valve and rubber ball complete. Ventilate the closet with a 3" lead pipe connected with the iron vent. Closet cup and pull to be nickel plated and to be inserted in the seat. Closet to have enameled drip tray.

Safe Pans.—The bath tub, bowl, and closet are each to be provided with 3½ lb. lead safe pans, edges turned up 2" all around, and to have a ¾" lead waste pipe to the cellar.

Wash Trays.—Supply the wash trays with hot and cold water, through ⅝ *aaa* lead pipe and Fuller patented cocks, with flange and thimble. Provide with a 2" main waste, properly tapped and connected to main soil. Provide necessary plugs and chains and flanges. Also provide on end of pipe a cleaning cap.

Ventilation.—Every trap through house to be separately and independently ventilated from the crown by the same size pipe as trap.

Gas Pipe.—Put up the gas pipes with outlets where shown on the plans and according to the rules of the gas light company. All outlets are to be capped and all pipes tested. All side lights are to be not less than 5' 6" from floor All drop lights are to be hung plumb.

Range.—Furnish, set, and make connections to water back, a No. 8 J. L. Mott's "Defiance" portable range.

BILL OF MATERIALS.

1 6"×10"×26'=130 sq. ft.			
1 3"× 3"×12'= 24 "			
1 3"× 8"×16'= 32 "			
1 3"× 8"×28'= 56 "			
1 3"× 8"×17'= 34 "			
1 3"× 8"×15'= 30 "			
1 3"× 8"×26'= 52 "			
1 3"× 8"×14'= 28 "			
9 2"×10"×21'=315 "			
3 2"×10"×24'=120 "			
6 2"×10"×26'=264 "			
4 2"×10"×29'=192 "			
1 2"×10"×12'= 20 "			
1 2"×10"×20'= 34 "			
7 2"×10"×18'=210 "			
4 2"×10"×17'=116 "			
12 2"×10"×28'=552 "			
20 2"× 8"×24'=640 "			
5 2"× 8"×17'=115 "			
7 4"× 6"×22'=308 "			
4 4"× 4"×12'= 64 "			
2 4"× 4"×13'= 33 "			
1 4"× 4"×15'= 20 "			
3 4"× 4"×24'= 96 "			
1 4"× 4"×17'= 23 "			
1 4"× 4"×18'= 24 "			
4 4"× 4"×14'= 76 "			
1 4"× 4"×20'= 27 "			
2 4"× 4"×16'= 42 "			
1 4"× 4"×22'= 29 "			
2 3"× 6"×16'= 48 "			
1 3"× 6"×12'= 18 "			
3 2"× 6"×15'= 45 "			
33 2"× 6"×18'=594 "	=4,391 ft. spruce timber, At per M..$20 00		$87 82
300 2"× 4"×12'=2,400 sq. ft.			
250 2"× 4"×13'=2,166 "	= 4,566 ft. hemlock, At per M...$15 00		$68 49
2,500 ft. hemlock sheathing, per M.....		15 00	37 50
1,500 ft. hemlock sheathing, for roofs, per M.....		15 00	22 50
2,250 ft. 0" siding, per M.....		25 00	56 25
100 ft. shingling, per ft.....		6	6 00
185 ft. piazza floor, per ft		3½	6 47
200 ft. piazza ceiling, per ft.....		3½	7 00
4 piazza columns.....	..		8 00
2 short columns.....	..		2 00
8 piazza brackets, each.....		30	2 40
27 ft. piazza rail, per ft		25	6 75
2 stoops, ready to put up.....	..		9 00
Lattice under piazzas.....	..		7 00
Cellar door outside	..		6 00
72 ft. verge boards, per ft.....		8	5 76
68 ft. gutter and tin.....		15	10 20
140 ft cornice, per ft		12	16 80
110 ft. piazza and flat roof cornice.....		10	11 00
400 ft. tin roof.....		6¼	26 00
Leaders.....	..		7 50
1,225 ft. slate roof, per sq. ft..		7	85 75
150 ft. water table and piazza fascia....		5	7 50
2,800 ft. flooring, per sq. ft		3	84 00
300 ft. corner boards, etc..... ...		3	9 00
6 cellar windows, complete.....		1 50	9 00
13 first story windows, complete.....		8 00	104 00
7 second story windows, complete....		8 00	56 00
5 third story windows, complete.....		7 00	35 00
Front door and frame, complete....	..		10 00
20 inside doors, complete.....		6 50	130 00
300 ft. surbase.....		4	12 00
Cellar stairs, complete.....	..		5 00
Main stairs, complete	..		80 00
Prepared materials for closets.....	..		25 00
Nails, papering, etc.....	..		30 00
Labor.....	..		325 00
Painting.....	..		100 00
Plumbing.....	..		275 00
Mason work.....	..		700 00
Total			$2,492 69

A KANSAS CITY RESIDENCE.

The handsome new residence illustrated in the colored plate of the present issue is on a pleasantly located lot on the west side of Garfield Avenue, between Independence and Lexington Avenues, Kansas City, Missouri, for Robert Beatty, Jr., Esq.

The building fronts east and south, the principal front facing the east. It sets back a sufficient distance from the road to allow of a fine lawn being formed in front, and presents with its well arranged sky lines and spacious covered balconies a very attractive and imposing structure.

The exterior walls are all constructed of pressed brick, laid in red cement mortar; the roof is covered in with slates, and the woodwork is painted in pleasing colors.

The exact construction of the house is indicated by the specification printed below, from which it will be seen that the reception hall, sitting room, and stair-

way are finished in red oak, the newel and the balusters of stairs are "spiral turned," as shown on our sheet of details. The dining room is finished in white oak, the parlor in cherry, and the kitchen and second story all in natural woods, finished with three coats of oil and white shellac

The mantels are of wood, correspond in general design with the trim, and have "over-mantels" and beveled plate glass mirrors. The house is furnished throughout with a complete system of speaking tubes, electric bells, annunciators, etc.

The system of heating is hot air, supplied by a McGee furnace, and distributed to all rooms except kitchen and servants' room. This, in conjunction with the fireplaces, proves most economical, and insures a more perfect ventilation, as in early spring and autumn fires may be lighted on the hearths without resorting to the furnace, and in colder weather both may be used.

James W. Bryan, of No. 110 Vine Street, Kansas City, Mo., is the architect of the house, and Charles K. Balcom, of Kansas City, is the builder.

The cost of the residence as represented was $7,500.

GENERAL CONDITIONS.

The contractor to furnish *all* transportation, labor, materials, and utensils necessary for performing and completing the work. All materials to be the *best* of their respective kinds, and the work to be executed in a thorough and workmanlike manner, according to the true spirit and meaning of the drawings and these specifications, which are intended to include everything necessary for the proper finishing of the work, whether every item necessary to that end is particularly mentioned herein or not The contractor is to furnish and pay for the necessary building permit, to be responsible for all violations of the city building laws, and to obtain official licenses from the proper authorities for openings into the public sewers, and pay all fees for same.

MASON.

Excavation.—Excavate the entire area occupied by the building for a cellar, to the depth as shown on section, the excavation to extend six inches beyond the wall line everywhere.

Trenches.—The trenches to be three feet wide and carried twelve inches below the cellar bottom. Dig the required trench for the dwarf walls of veranda and carriage porch, the same to be not less than two feet below the surface, by the required width.

Vault.—Excavate a privy vault where directed, the same to be 3 × 5 in plan, by 8' deep.

Cistern.—Also excavate for a cistern where shown 8 × 18. All earth taken from excavations to be carted off the premises.

Stone Work.—The footings to be of good flat stone, 12" thick, projecting 6" beyond the wall line, and firmly embedded into the earth. The footing course to be flushed up with "spawls" and liquid cement, and allowed to set, before starting the foundation walls, include an 18" × 12" rubble footing for the partition wall in cellar, and the dwarf walls of porches.

Foundation.– Build the foundation walls of good flat building stone, thoroughly bonded with ample headers in every course. The walls built to a line both sides, carried up perfectly plumb, and finished to the proper level heights Particular attention to be paid to angles, that they correspond exactly with the "*figured dimensions*" of the plans. All frames to be walled in perfectly plumb, square, level, and in their several proper positions, as figured on plans.

Sills.—Provide for the rear cellar door a 19" × 5" × 3' 10" plain sill of Cottonwood Falls stone. Use rubble sills elsewhere.

Mortar.—All rubble work to be thoroughly pointed up both sides of wall. The mortar to consist of Springfield white lime, Craig & Roberts washed sand, mixed in the proper proportions. Add one bushel Louisville cement to three bushels lime, the cement to be added when needed for actual use only, and none allowed to stand overnight, or to be retempered.

Range Work.—Build four courses of range on front wall where shown on plan. The same to have 6" bed, 10" face (rock face), each course to be thoroughly anchored to backing. All range stone to be laid in cement, and pointed with a tucking tool after settling has taken place. Include carriage porch in the above work.

Water Table.—The water table to have 5" bed, 8" face, and 1" wash.

Window Sills —All window sills to have 5" face by the required bed and length.

Lintels and Springers.—The lintels over doors and windows to have 10½" rock face. Prepare the springers for second story windows as shown on drawings.

Door Sills.—All door sills to have 8" face, 14" bed, 1" drip channels, and 4" lugs, all of Cottonwood Falls stone. The water table, window sills, and all caps and springers to be of "light" Warenshurg stone.

Brick Work.—All bricks used on the exterior surface of walls are to he the Kansas City calorific pressed brick (AA), ganged to uniform thickness, and laid in red mortar. The red mortar used to be guaranteed permanent color. The joints and beds of pressed brick work not to exceed $\frac{3}{16}$" in thickness, or four courses of brick not to exceed 10½" in height. All walls to be carried up perfectly plumb and straight, and finished to the proper level heights. Clip the brick every seventh course for blind headers. Back up the pressed brick with good hard burnt common brick with solid flushed joints, leaving no empty spaces in the walls. Include 9" partition wall in cellar.

Arches.—Turn relieving arches at the back of all stone lintels, and in other places where required. Turn 4" trimmer arches for the support of all hearths.

Chimneys.—Cap out the chimneys as shown on elevation, leaving the flues of the size as figured on plans, outside walls of each chimney to be 8" thick and the partitions 4". All flues to he thoroughly plastered inside. Build the several fireplaces as shown, the back of all fireplaces to be 9" thick.

Thimbles.—The brick mason to furnish and set all thimbles required in flues, and project far enough to receive plaster, the same to he put in at the time the chimneys are built.

Finally, clean down all pressed brick with diluted acid, without defacing stone work, and leave all complete.

CARPENTRY.

Frame all timbers. Joists, partition studs, baleony joists, rafters, lintels, etc., are to be No. 1 W. P., and constructed according to the sections and detail drawings. All floor joist to be sized with a crown of ½" on upper edge. For size of joist, rafters, etc., see sections. A header and trimmer to be put in double, and place double joist under all partitions running in same direction. All joist, studding, furring, etc., to be set 16" on centers. Double stud around all openings, and place headers 4' high.

Lintels.—Place all necessary wood lintels to all openings requiring it.

Furring.—Fur all brick walls with 1 × 2 furring strips, 16" on centers, vertically, and well spiked to plugging in brick joints.

Bond Timbers.—Furnish all bond timbers and wood brick for insertion in walls, necessary for the proper execution of the work to be finished.

Roof.—Construct the roof as shown on roof plan, using 2 × 6 rafters. All valley rafters to be 2 × 8, and all firmly secured to walls, with all necessary iron straps, anchors, rods, and bolts, as shown on detail drawing. The rafters tied with 2 × 6 cellar beams, 8' above attic floor line. Provide and firmly set in proper position the "lookouts" for the projecting eaves, as shown on detail.

Cornice.—The circled cornice on dormer windows from bath room to be of No. 27 galvanized iron, well soldered and riveted together, and all requisite weather joints as shown.

Sheathing.—The entire roof, including porches and balconies, to be tight sheathed with No. 2 surfaced sheathing boards, square edge, thoroughly nailed at every bearing.

Floors.—All floors, except kitchen, to be laid with first common white pine. Flooring tongued and grooved, well mill worked and blind nailed at every bearing with 8d. nails. Treat porch and balcony floors with like material. Lay the kitchen floor with ⅞ × 3½ Georgia pine, selected for close, even grain, carefully laid with close fitting joints, and all to be hand smoothed after laying, and all prepared for waxing, and kept protected from damage. The kitchen floor is not to be laid until the plastering is finished.

Attic Floor.—Lay the attic floor with Selfen flooring.

Wainscot.—Wainscot the kitchen 3' and the bath room 4' high, with narrow beaded T. pine wainscoting ⅝ thick, thoroughly hand smoothed, and finished with cap and base, as shown on detail.

Frames.—Make all door and window frames of the sizes as figured on plans. All windows to have box frames with 1' 8" pulley styles, made in the usual way. All exterior door frames to have paneled jambs 1¾" thick, rabbeted. All interior door frames on first floor to have rabbeted jambs of the same kinds of wood as the finish of rooms in which they show. All frames on second floor to have 1⅜" rabbeted jambs of clear white pine. All door frames that are marked with the specific "T" to have transoms of sufficient size to bring the frames to a uniform height.

Doors.—All doors of the sizes as figured on plans. Those showing into reception hall, parlor, dining room, and sitting room, to have veneering ¼" thick each side, and finished 2¼" thick, all other doors No. 1, 1¾" white pine.

Trim.—The reception hall will be trimmed with red oak; dining room and sitting room, white oak; parlor, cherry; kitchen, T. pine; all rooms on second floor, white pine. The dado in hall, dining room, and sitting room, and all trim throughout, to he in strict accordance with detail drawing. Interior woodwork to be finished up perfectly clean, well hand smoothed, scraped, and brought to a true and even surface, and all marks and stains removed on such work as requires finishing in natural manner.

Porch and Balconies.—Construct the porches and balconies as shown, using 6" × 6" turned posts of poplar, 2¼" × 2¼" turned balusters, 3½ × 3½ hand and foot rail of white pine, all as shown on detail drawings. All porch and balcony floors to pitch one inch from building, and white leaded at joints, each course to be one continuous piece, and all blind nailed at each bearing.

Closets.—Form closets as shown, and fit up the same with 7" band, with 10" shelf above. Place three-pronged copper wardrobe hooks on the band, not less than 8' apart.

Pantry.—Fit up the pantry with counter shelf 18" wide, 3' above the floor, and place five 10" shelves above counter. Place under counter shelf a case of four drawers, the full depth of counter, all to be firmly dadoed together.

China Closet.—Fit up the china closet with counter shelf, 2' 10" above floor, and place six portable shelves above. Below the counter shelf put in a case of drawers as directed, the same to be provided with locks and ornamental pulls. The shelving above counter to he fitted with glass doors hung with brass butts, as directed.

Main Stairs.—The entire stairway, including the floors of landing, to he built of thoroughly seasoned red oak, the newels and balusters to be spiral turned as shown, the newel to he glued up of seasoned plank, and warranted, the risers 1", treads 1¼", housed into stringers both ends, the risers and treads tongued and grooved to each other both front and back, thoroughly wedged and pinned and glued up everywhere, the face string and coping moulded and paneled and wrought in the manner as shown.

Servants' and Attic Stair.—Build the servants' and attic stairs as shown on plans, using ⅞" risers, 1⅛" treads of B. S. W. P., neatly and securely put together, all boxed.

LATH AND PLASTER.

Lath the building with good, sound, straight grained lath, free from loose knots and bark. All lathing to be horizontal. No vertical lathing permitted in any case. No lath allowed to pass behind the studs from one room to another, all corners and angles made solid everywhere; should there be any stud or angle not securely tied, stop and notify carpenter, and see that they are corrected and made permanent before the lath goes on.

Plaster all walls and ceilings with good coats of hair and brown mortar, made of the best Springfield lime, thoroughly slaked and mixed with the proper proportions of "Craig & Roberts" washed sand, well whipped ox hair, all to be thoroughly mixed on the premises at least ten days before using.

All plastering to he properly put on and applied with sufficient force to secure good clinches. Level and float the brown coat and bring it true and straight with the grounds everywhere, and the ceilings brought to a true and even plane. All plastering to be carried down to floor, whether wainscoted or not.

Finishing coat to be put on after the other coats are thoroughly dry, and to be compounded with "lime putty" and "Bronson's marble finish," mixed in three parts of marble finish and two parts lime putty, and allowed to stand two days before using, and to be applied in a careful manner, as directed, so as to secure a good and workmanlike job.

The plasterer to do all necessary patching and repairing after other mechanics are through without extra charge, and clean out the building, leaving the same broom clean, and remove all rubbish from the premises that has accumulated from his work.

PAINTING AND GLAZING.

Paint all the exterior wood, tin, and galvanized iron work that is usually painted, three good coats of lead and oil, in such colors as directed. Pure linseed oil, pure American lead, and the best shellac to be used throughout, all exterior woodwork to be primed as soon as work is up. All tin and galvanized iron work to be primed with a heavy coat of red lead.

All colors to have good body, well and evenly laid on, covering every portion. All exterior painting to be done as far as possible in dry (not dusty) weather.

All damage done by wind or rain to be made good by painter, and all to be left in good order when building is done.

INTERIOR WORK.

All hardwood on first floor to be filled with Wheeler patent filler, thoroughly rubbed and cleaned off shortly after putting it on, and while wet, and finish with two coats of the "Murphy Transparent Wood Finish Interior," well rubbed with rags each coat, and finish to a true and even surface. Treat the kitchen and bath room with two coats in like manner. All woodwork on second floor, except bath room, to receive three coats of lead and oil in such tints as directed. The hall to be grained to correspond with stairway, and receive one coat of best coach varnish.

Glazing.—Glaze all windows with the best American A. A. D. S. glass, free from waves, curls, and smoke stains, thoroughly beaded, and puttied and pinned with glaziers' points.

Ornamental Glass Work.—The transom over parlor window, the upper panels of reception hall doors, and the stair window to be lead glazed, with opalescent stained glass of a neat design, costing not less than

$5 per square foot. All work in this line to be first class in every particular.

Galvanized Iron Work.—Make all crestings, finials, gutters, and conductors of galvanized iron, No. 27. The crestings, gutters, and finials constructed as per detail, and the rain water conductor to be 4" in diameter, corrugated, with all requisite elbows and branches, with a reversible cut-off at grade, connecting with earthen drains leading to cistern and drains.

Slating.—Cover the entire roof, dormers and dormer cheeks, porch, and balcony roofs with the best quality Pennsylvania black slate, 10"×15", all laid on a bed of best tarred paper, carefully stretched, lapped, and tacked on. Place suitable tiling strips at all eaves, and secure each slate with two galvanized nails. The cheeks of all dormers, chimneys, and all places requiring it, to be flashed with good quality of zinc, the slater to include zinc. Valley of sufficient width. The slater will be held responsible that he furnishes ample flashing stock, and deliver up work complete in every particular.

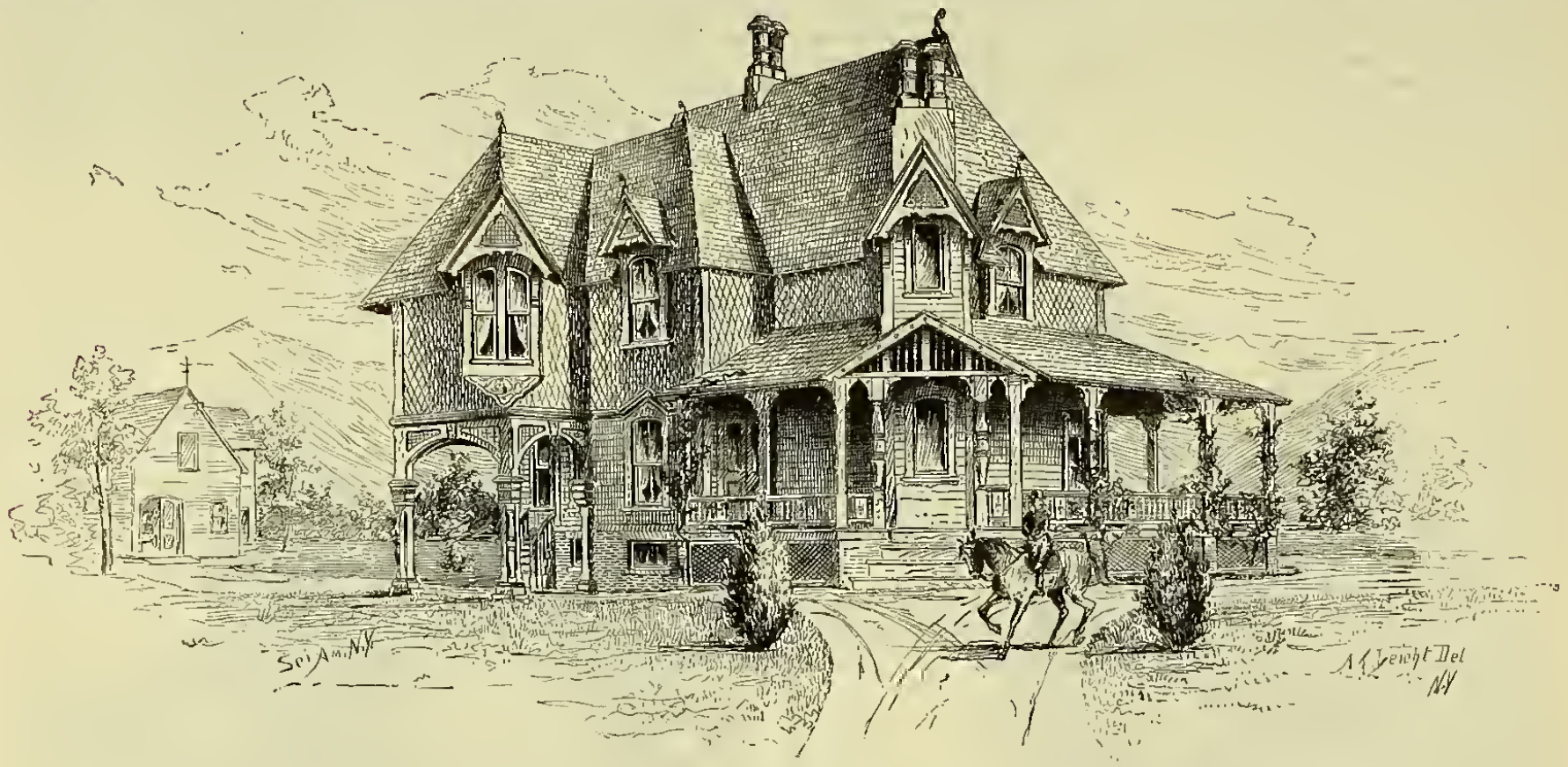
Gas Piping.—Fit up the house with the requisite size gas pipe, leaving drop and bracket lights where shown on plans. All work in this line to be done in accordance with the rules and regulations of the Kansas City Gas Light Company, and to be paid for on their respective certificates.

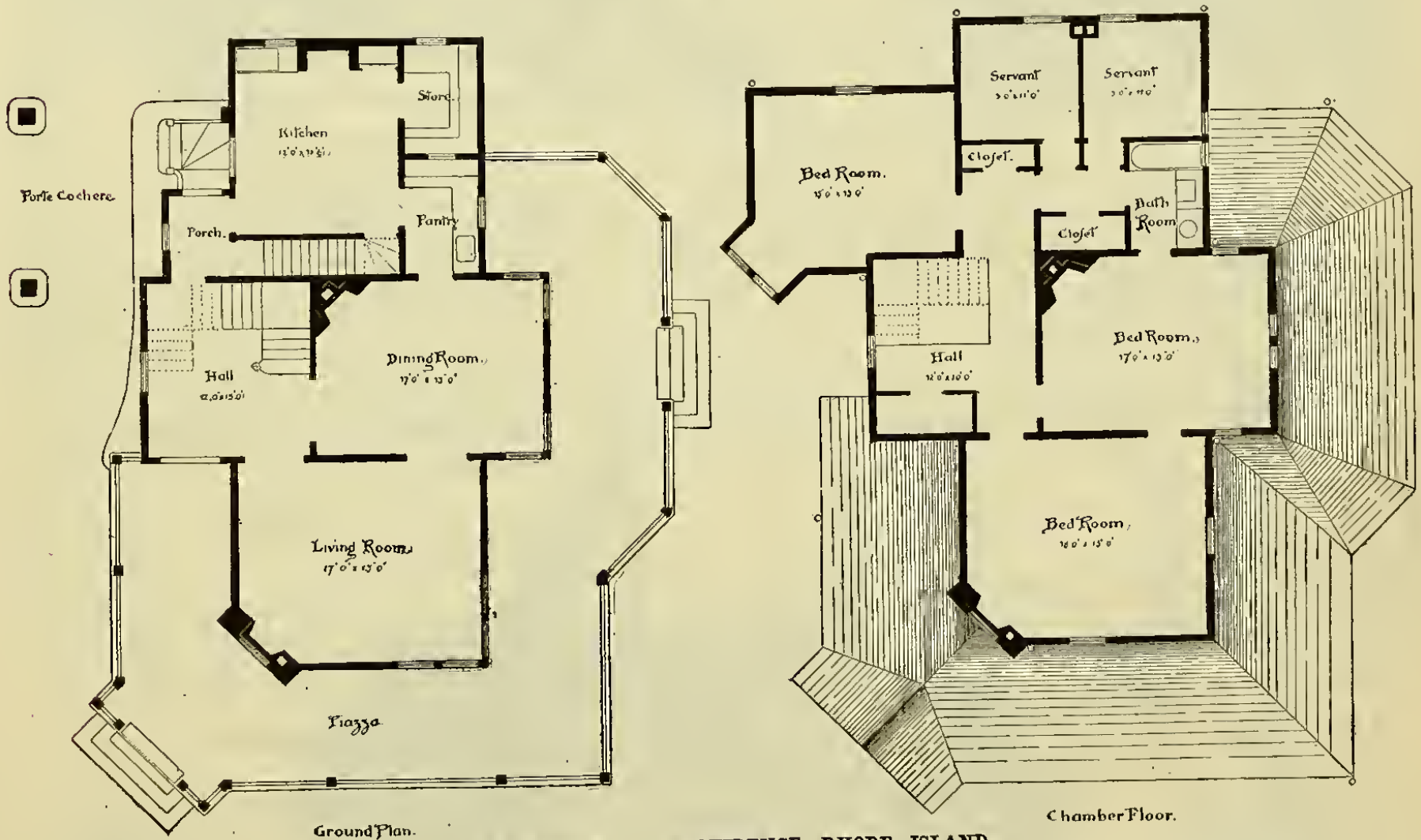
Plumbing.—Provide and put in complete working order, with necessary cocks, plugs, traps, fittings, and connections.

Place in the bath room a fourteen ounce copper planished tub, with all requisite nickel plated fittings. Include an approved closet, as shown, and a 14" countersunk wash bowl, with moulded top, sides, and back of the best Italian marble. Provide for the kitchen a 20"×30"×6" white enameled sink, where shown, and put in position in the kitchen a galvanized iron boiler, with inside strengthening rings, cast heads, and all requisite couplings, complete, the boiler to have a capacity of forty gallons, resting on cast iron standards. Hot water to be taken from boiler and carried to sink, wash bowl and bath tub on second floor. Place 3 lb. lead safings, turned up 1½" and sloped to drain themselves. All lead supply pipes from city pressure to be extra strong, and wastes light. In putting up pipes, care is to be taken to have them so the whole system can be drained at will, and all as secure as possible from frost, and left accessible for inspection and repairs. The soil pipe to be 4" cast iron, thoroughly tarred inside and out. The joints of soil pipe to be fitted into hubs or sleeves, and run with melted lead on hemp gasket and calked tight. The soil pipe to connect with earthen drain in cellar, pass up through the building, and extending at least two feet out of roof, and covered with ventilating cap, and properly connected by Y or T branches to all wastes, traps, etc. Make all connections with the city mains and public sewer, and include approved iron box and stop in sidewalk, and lawn sprinkler, where directed. Put separate stop and waste on service under house, and at the foot of every riser. Test all pipes for leakage, and leave the entire job in a complete working condition.

A RESIDENCE AT PROVIDENCE, R. I.

We illustrate herewith, by perspective and plans, an attractive residence lately built at Providence, R. I., at a cost of $5,500, E. I. Nickerson, architect. This dwelling has a number of desirable features, and the plans will well repay examination.





A RESIDENCE AT PROVIDENCE, RHODE ISLAND.

Plans and Specifications.

Full plans, specifications, and sheets of details, complete, ready for the builder, may be obtained at this office, for any of the structures illustrated in this publication. We also prepare plans for buildings of every description, including churches, colleges, schools, stores, dwellings, carriage houses, barns, etc.

We are assisted in this work by able architects. Terms moderate.

MUNN & CO.,
361 Broadway, New York.

A $3,500 DWELLING.

We give herewith elevations and plans for a $3,500 house, by H. C. Palmer, architect, to be erected at Jersey City Heights, N. J. The estimate includes the "modern conveniences." The house presents a pleasing appearance, and the plans are considered satisfactory.

Women as Architects.

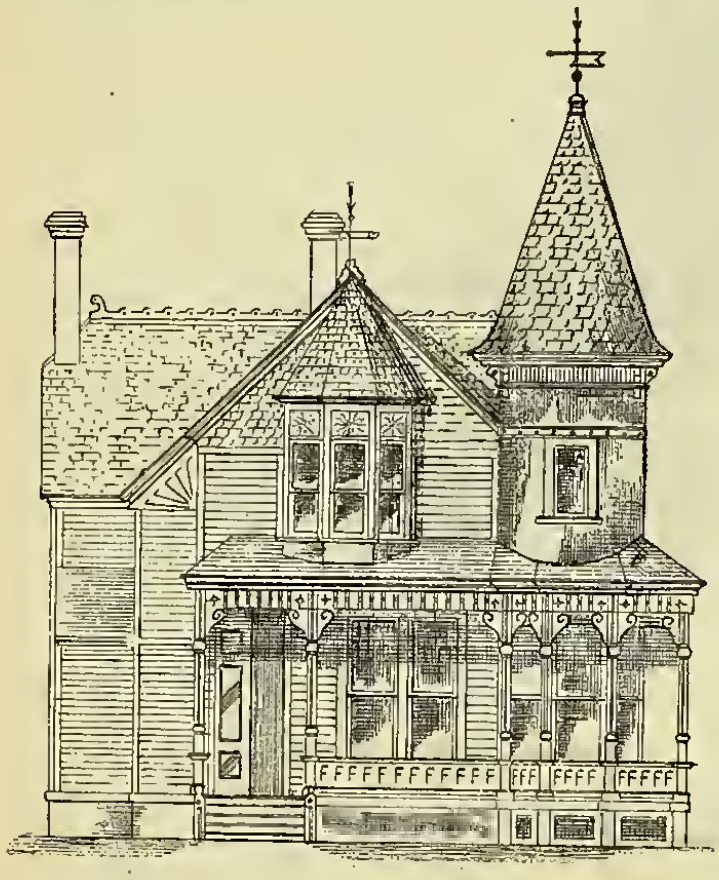
C. Harrison Townsend, a London architect of some note, writes in the *Pall Mall Gazette* on this subject. His remarks refer to the girl and young woman of the middle class, and he asks, "What really valid objection is there to asking her to become a 'draughtswoman,' and in due course an architect?"

The requisites for the preparation of architectural drawings are neatness and delicacy of touch, attention to detail, patience, and care, which women ought to possess more than men.

The present course of architectural training in England is as follows:

A youth on leaving school with an aptitude, more or less, for the profession, is articled as pupil for four or five years to an architect, to whom he pays a premium. This is, of course, in proportion to the position and repute of the architect in question, but may be stated at from a hundred pounds to four or five times that amount. As with solicitors, so among architects, the pupil is supposed by having "the run of the office," to acquire an intimate knowledge of its work—design, draughtsmanship, knowledge of materials, official routine, and so on. If a young fellow of parts, he soon begins "to feel his legs" and to understand his work, and, if wise, supplements his office instruction by attendance at the admirable classes of the architectural association and elsewhere. At the end of his articles he is qualified to dub himself a "junior draughtsman," in which capacity he claims salary from a pound to two pounds a week. A couple of years should then see him a draughtsman proper, and in a position to obtain three, three and a half, or four guineas a week. In many cases, of course, thanks to such "backing" of his friends as he may be fortunate enough to get, the lucky pupil can set up on his own account immediately his articles are completed.

In this training Mr. Townsend finds but two objections. The first one is the "commingling of the sexes" which would result from their introduction to an office. This objection is proved to be invalid by the American experience in using females in all kinds of office work without trouble. But a "women clerks' room" would remove that conservative objection. The other objection is that attached to the inspection of buildings under construction. To those not wishing to encounter this objection, the way to drawing board work and competition in plans, interior decoration, etc., is open.



FRONT

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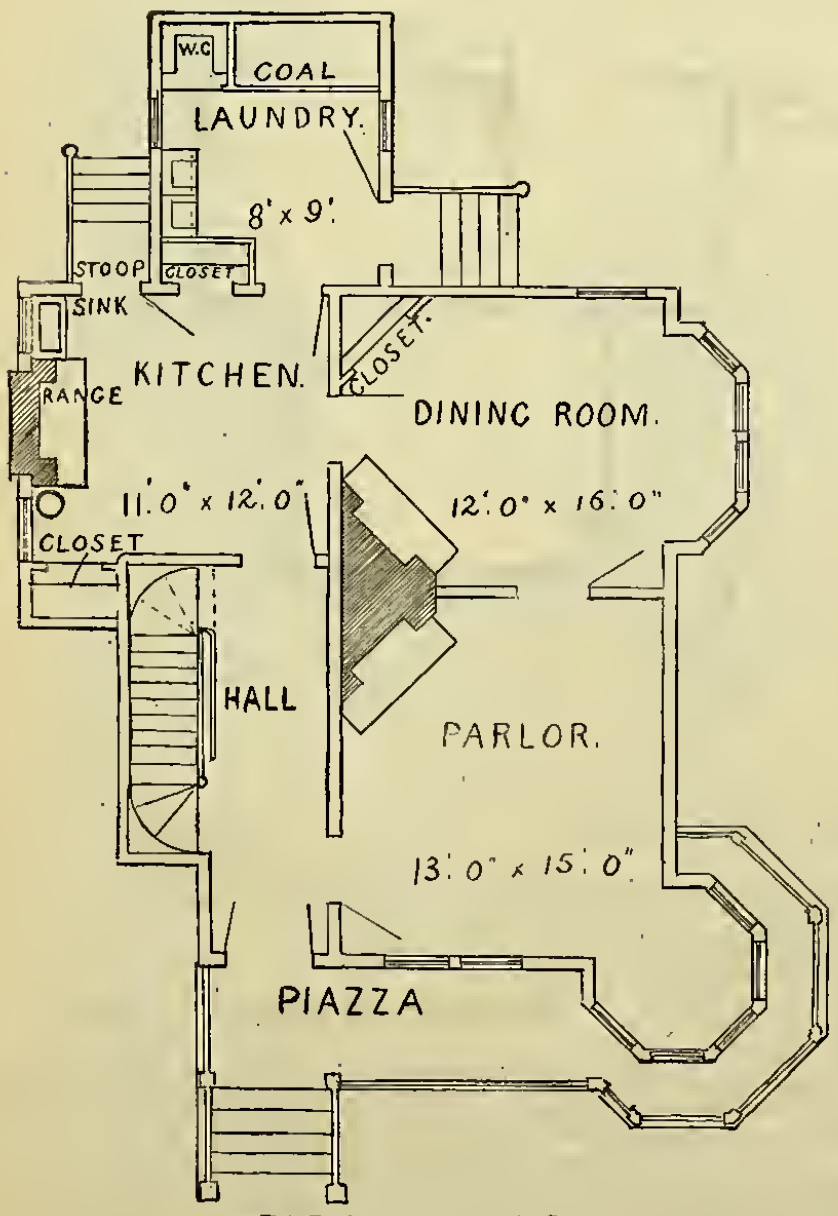
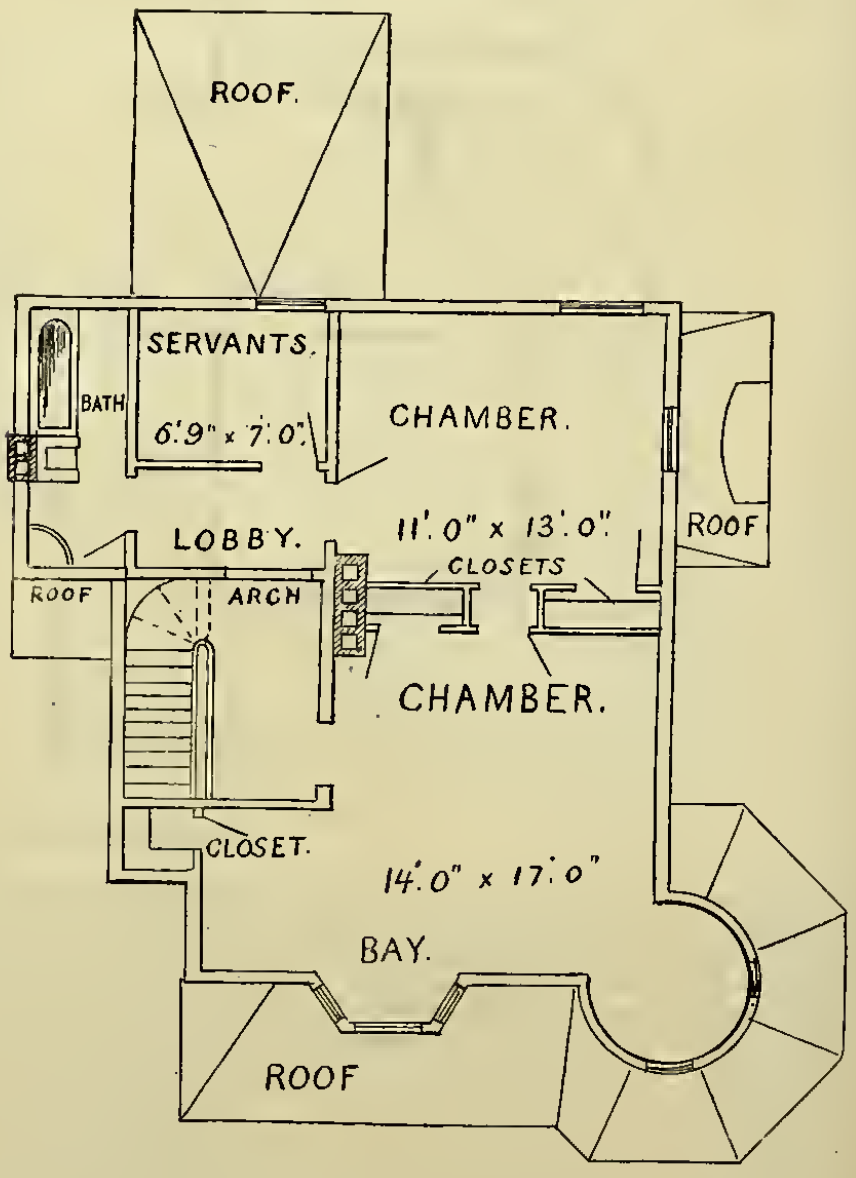


FIRST FLOOR.



SECOND FLOOR.

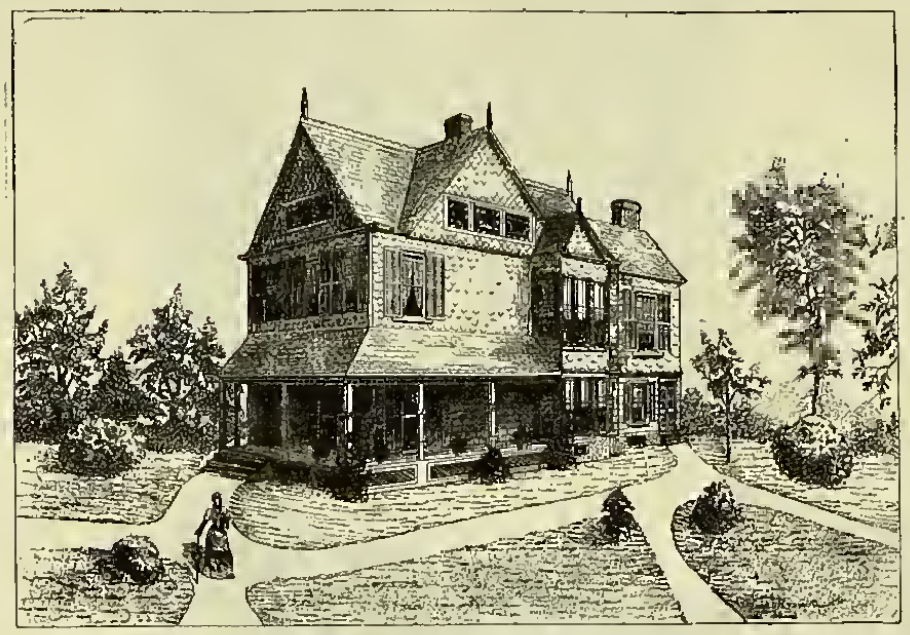
A $3,500 DWELLING.

A DWELLING AT EAST NEW YORK.

Our engraving shows a pleasing dwelling erected at East New York. The cost is about thirty-five hundred dollars It has an ample piazza, and the interior arrangement is good.

Terra Cotta Panels.

The way in which terra cottas were introduced into walls was not unlike that commonly used for inserting stone, marble, corbels, and jambs of stone. It is evident that the general skeleton of the wall was first constructed, keeping some bricks protruding, so that afterward the casts, figures, heads, cornices, and such like might be introduced into the interstices left between brick and brick out of the redundant material beyond the substance of the wall itself. Such pieces, if flat or slightly salient, were fixed in simply with lime and plaster; at the most, for greater strength, hooks of iron or mere nails were used. Large blocks were secured in the same way as corbels or stone cornices. They took, however, the precaution to hollow out by hand such figures as required to be fixed to the bricks that jutted beyond the wall level—sometimes, also, in order to lighten them, or to promote the uniform burning of large pieces, such as large heads and statues. The utmost care to strengthen them was bestowed on the first rows of cornices and on such architectural members as had to sustain others; these upper portions, on the contrary, being borne by the lower and fixed to the wall as best might be without any extreme care, but never made salient by excessive or abrupt protrusion. They are always graduated and pitched, so that rain water may never flow down behind, but invariably along their front. In Italy, through the sudden changes of temperature, frost will soon split the hardest marbles; nevertheless, although these terra cottas are not attached to the wall in a very elaborate fashion, yet in consequence of the builders' precautions to prevent water standing on them, they appear little injured by frost.—*V. Ottolini.*



A DWELLING AT EAST NEW YORK.

Dumb Waiters.

The use of dumb waiters in private houses, apartments, flats, tenements; stores, and for light factory work, is largely on the increase, owing probably to the simplification and uniform construction in respect to sizes; and would have been much larger but for the many obstacles in their way, such as the many sizes required, the high price asked, and the complicated mechanism of adjusting them—most fixtures requiring the services of a man skilled in the business to put them up.

All these objections are overcome in the New York Safety Dumb Waiter, as the fixtures are made in one size only, and this is adapted to any size waiter. They are put up one complete set in a box, weighing, all told, about forty-five pounds; are handsomely bronzed; and are so simple to adjust that any carpenter, by the aid of the diagram and instructions which accompany each set, can place them in position.

Dumb waiters have heretofore caused more or less trouble, by the ropes holding them giving out and letting the car fall, often causing great damage, and in some cases serious accidents. The safety rope attachment with which these fixtures are provided, and from which they derive part of their name, prevents this, as a second rope put on slack, and on which there is no work or wear, immediately comes into play and prevents falling or accident, should the hoisting rope break. Another complete and desirable arrangement is the cam brake attachment, by which the car of the waiter can be held at any desired point when loaded beyond balance, and which can be operated from any floor. The adjustment of these fixtures allows the car to run closer to the floor at bottom and nearer to the ceiling at top than any other made, a desirable feature, especially when heavy articles have to be carried.

A full sized model waiter is running at the store of Messrs. John H. Graham & Co., 113 Chambers St., New York, who are the manufacturers' agents. These fixtures are protected by letters patent, and are made and controlled by the Edward Storm Spring Co. (Limited), Poughkeepsie, N. Y., manufacturers of the Edward Storm side bar springs and hardware specialties. Illustrated catalogues with full descriptions can be obtained from them or from their New York agents on application, and we would advise any of our readers who may need a dumb waiter to send for one of these catalogues.

NEW POST OFFICE, SPRINGFIELD, OHIO.

We give an illustration from the *American Architect* of the new post office building at Springfield, Ohio, M. E. Bell supervising architect. It is a substantial structure, effective and satisfactory in appearance.

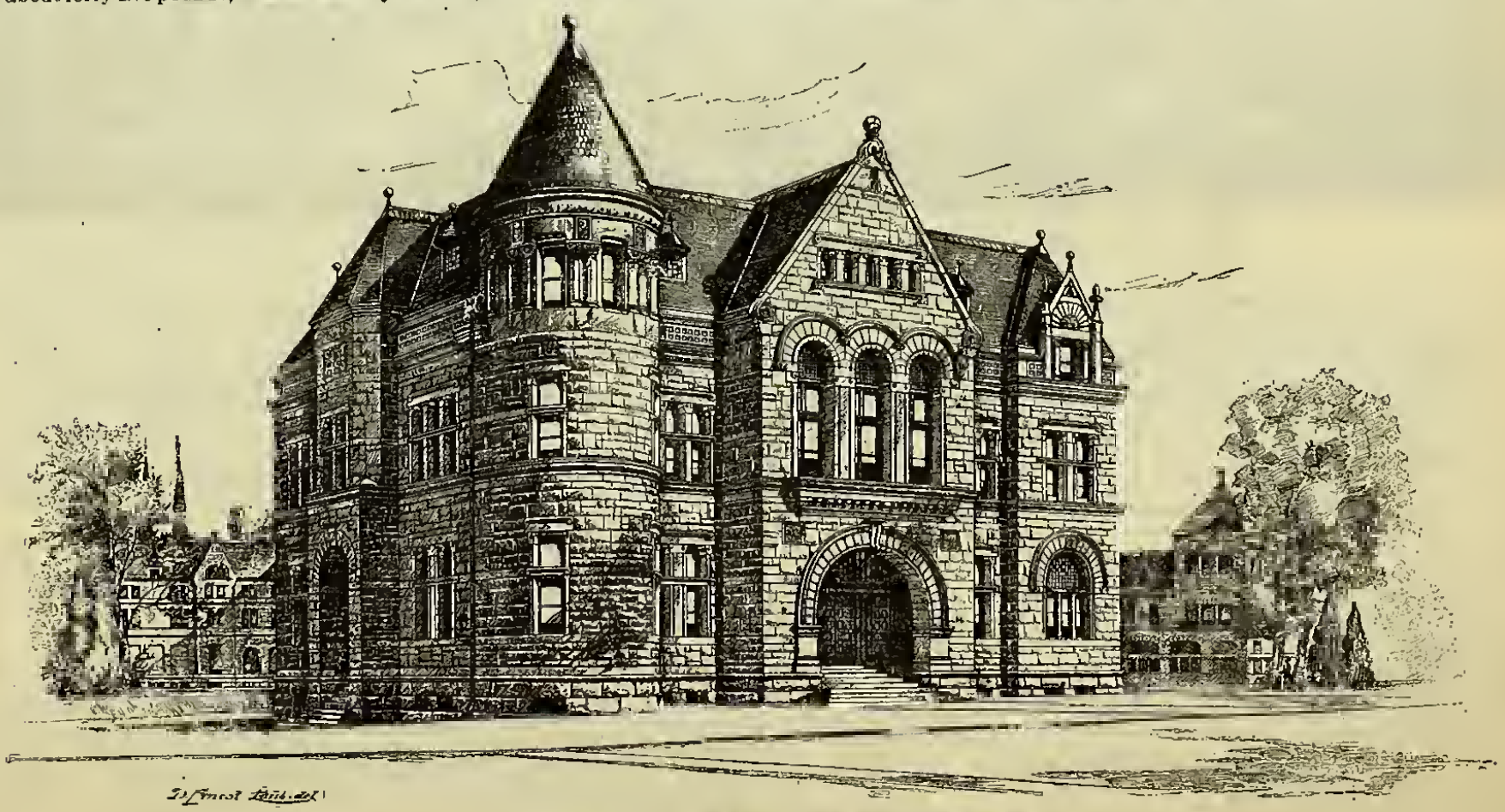
Acoustic Effects of the Britannia Bridge.

Some of the acoustic effects produced by the bridge are interesting. The report of a pistol fired beneath the tubes is repeated three or four times. In this particular, however, they are far surpassed by the large brick arches constructed by Mr. Brunel over the Thames at Maidenhead, under which the echo of a pistol is repeated from twelve to twenty times. The rapid repetition of echoes from each of the T irons on the side of the tube gives rise to a shrill, whirring musical note. When any violent noise is produced on the adjacent shore the note is the same, whether produced by the blows of the riveters or the report of cannon, and corresponds to the low D on a concert flute. The distance between the T irons is two feet. If the same note is sounded by a flute close beside one of the tubes, it is a perfectly soft and musical tone, which lasts many seconds. The report of a pistol produces the same effect much more powerfully. The effect of music in the interior is very striking, and a concert which was given in one of the tubes to the workmen was very effective. The floor was boarded, and the interior being illuminated by several thousands of candles, had a most imposing and gorgeous appearance. The cells of the top and bottom form excellent speaking tubes, and conversation may be carried on through them even in a faint whisper. By elevating the voice, persons may converse through the entire length of the bridge, a distance of more than 500 yards. If one end of the cells be closed, they return a powerful echo; but although a whisper is thus distinctly repeated, the loudest whistle does not appear capable of returning any echo.—*E. Clark.*

Green or Dry.

"Which is the stronger—green or dry timber?" This question is now under discussion by many of the leading lumber journals, and has provoked a perfect avalanche of opinions from experts and others. This discussion, after all, seems rather bootless. Some kinds of timber are stronger when wet or green. All woods are harder and less liable to bend when dry than when wet or green; but most hard woods when wet possess more tensile strength than when dry. Timber thoroughly seasoned is more brittle than when green, and with the necessary force will break square off, while the same timber green would stand about the same pressure by bending without breaking. Take a hickory sapling that it is almost impossible to break in its green state, although it may bend double, and after it is thoroughly dry one may easily break it almost "square off." So with almost any kind of timber. Dryness makes it stiffer, more unyielding, but in very few instances stronger.—*Dixie.*

WILLOW furniture can be cleaned by using salt and water. Apply with a nail brush, scrub well, and dry thoroughly.



THE NEW POST OFFICE, SPRINGFIELD, OHIO.

A MODERN ENGLISH DWELLING, MOWBRAY COTTAGE, EAST FINCHLEY.

This is a small house, built recently, in an old detached garden. The exterior is of stock bricks, with moulded red facings. The upper story is rough cast, and the roofs are covered with red plain tiles. Internally, the house has some good rooms (the dining room being 20 ft. by 14 ft., exclusive of bay), and is most carefully finished, a special feature being the woodwork. The cost was about $7,500. The architect is Mr. C. E. Sayer, 17 Soho Sq., London.—*The Architect.*

Regulation of Building in Boston.

The following sections are from the revised ordinances of Boston, Mass., for 1885, to regulate plumbing and vaults and drains:

PLUMBING.

SECTION 1. No person shall carry on the business of plumbing unless he shall have first registered his name and place of business in the office of the inspector of buildings, and notice of any change in the place of business of a registered plumber shall be immediately given to said inspector.

SEC. 2. Every plumber, before doing any work in a building, shall, except in the case of the repair of leaks, file at the office of the said inspector, upon blanks to be provided for the purpose, a notice of the work to be performed, and no such work shall be done in any building without the approval of said inspector.

SEC. 3. Every building shall be separately and independently connected with the public sewer, when such sewer is provided, and, if such sewer is not provided, with a brick and cement cesspool of a capacity to be approved by the said inspector.

SEC. 4. Drains and soil pipes through which water and sewage are used and carried shall be of iron when within a building, and for a distance of not less than five feet outside of the foundation walls thereof. They shall be sound, free from holes and other defects, of a uniform thickness of not less than one-eighth of an inch for a diameter of four inches or less, or five thirty-seconds of an inch for a diameter of five or six inches, with a proportional increase of thickness for a greater diameter. They shall be securely ironed to walls, laid in trenches to uniform grade, or suspended to floor timbers by strong iron bangers, as the said inspector may direct. They shall be supplied with a suitable trap, placed, with an accessible clean out, either outside or inside the foundation wall of the building. They shall have a proper fall toward the drain or sewer, and soil pipes shall be carried out through the roof, open and undiminished in size, to such height as may be directed by the said inspector, but no soil pipe shall be carried to a height less than two feet above the roof. Changes in direction shall be made with curved pipes, and connections with horizontal pipes shall be made with Y branches.

SEC. 5. Rain water leaders, when connected with soil or drain pipes, shall be suitably trapped.

SEC. 6. Sewer, soil pipe, or waste pipe ventilators shall not be constructed of brick, sheet metal, or earthenware, and chimney flues shall not be used as such ventilators.

SEC. 7. Iron pipes, before being put in place, shall be first tested by the water or kerosene test, and then coated inside and out with coal tar pitch, applied hot, or with paint, or with some equivalent substance. Joints shall be run with molten lead, and thoroughly calked and made tight. Connection of lead pipes with iron pipes shall be made with brass ferrules, properly soldered and calked to the iron.

SEC. 8. Every sink, basin, bath tub, water closet, slop hopper, and each set of trays, and every fixture having a waste pipe, shall be furnished with a trap, which shall be placed as near as practicable to the fixture that it serves. Traps shall be protected from siphonage or air pressure by special air pipes of a size not less than the waste pipe; but air pipes for water closet traps shall be of not less than two inch bore for thirty feet or less, and of not less than three inch bore for more than thirty feet. Air pipes shall be run as direct as practicable, and shall be of not less than four inch bore where they pass through the roof. Two or more air pipes may be connected together or with a soil pipe, but in every case of connection with a soil pipe, such connection shall be above the upper fixture of the building.

SEC. 9. Drip or overflow pipes from safes under water closets and other fixtures, or from tanks or cisterns, shall be run to some place in open sight, and in no case shall any such pipe be connected directly with a drain, waste pipe, or soil pipe.

SEC. 10. Waste pipes from refrigerators, or other receptacles in which provisions are stored, shall not be connected with a drain, soil pipe, or other waste pipe, unless such waste pipes are provided with traps, suitably ventilated, and in every case there shall be an open tray between the trap and refrigerator.

SEC. 11. Every water closet, or line of water closets, on the same floor, shall be supplied with water from a tank or cistern, and the flushing pipe shall not be less than one inch in diameter. But this requirement shall not apply to water closets substituted for vaults, where the same are located outside of the building proper, and water closets may be arranged so as to receive their supply directly from the main with such fixtures as shall be approved by the inspector of buildings, and by the water board and the board of health.

SEC. 12. Pipes and other fixtures shall not be covered or concealed from view until after the work has been examined by the said inspector, and he shall be notified by the plumber when the work is sufficiently advanced for inspection.

SEC. 13. Plumbing work shall not be used unless the same has first been tested by the said inspector with the peppermint, ether, or water test, and by him found satisfactory.

SEC. 14. No steam exhaust shall be connected with any soil or waste pipe, or drain which communicates with a public sewer.

SEC. 15. Water pipes in places exposed to frost shall be packed with mineral wool, or other substance equally good, and they shall be cased to the satisfaction of the said inspector.

SEC. 16. A grease trap shall be constructed under the sink of every hotel, eating house, restaurant, or other public cooking establishment.

SEC. 17. The provisions of sections three to thirteen inclusive, and of section fifteen, of this chapter, shall apply only to buildings erected, or to work performed, after the seventeenth day of March in the year eighteen hundred and eighty-three.

VAULTS AND DRAINS.

SEC. 18. The owner, agent, occupant, or other person

A MODERN ENGLISH DWELLING—CHARLES E. SAYER, ARCHITECT.

having care of a building used as a dwelling, tenement, or lodging house, or where persons are employed, shall furnish the same with one or more suitable water closets, or, where such building is located on a street in which there is no public sewer, with a suitable privy, the vault of which shall be built in the manner hereinafter prescribed, and shall be of a capacity proportionate to the number of inhabitants of such building, or of those having occasion to use such privy. Every such building situated on a street in which there is a sewer shall have water closets, and shall not have a cesspool or privy connected with it, except where, in the opinion of the board of health, it can be allowed to remain for a longer time, and then only as said board shall approve. And whoever neglects to comply with the provisions of this section shall be liable to a penalty of not less than five nor more than one hundred dollars, or by confinement in the house of correction not exceeding sixty days.

SEC. 19. Every privy vault shall be made of brick and cement, and shall be of a capacity of at least eighty cubic feet, and the inside thereof shall be at least two feet distant from the line of any adjoining lot, unless by the consent of the owner of such lot, and at the same distance from any street or public or private passageway, and every vault shall be so constructed as to be conveniently approached, opened, and cleaned, and shall be made tight, so that the contents thereof cannot escape therefrom.

SEC. 20. All waste water and all matter discharged from water closets shall be conveyed through sufficient drains, under ground, to a common sewer, or to such reservoir, sunk under ground, as may be approved by the superintendent of sewers, and no person shall suffer waste or stagnant water to remain in a cellar or upon a lot or vacant ground owned or occupied by him.

A RESIDENCE AT EAST ORANGE.

We give a sketch of a new residence on Arlington Avenue, East Orange, N. J., erected not long ago, A. M. Stuckert, Newark, N. J., architect. This house can be built for about $4,500. Those who like variety of forms and angles, both for interior and exterior, will doubtless find something of interest in this illustration.

MESSRS. Munn & Co., SCIENTIFIC AMERICAN office, 361 Broadway, N. Y., are assisted by able architects in the preparation of plans and specifications for all descriptions of buildings. Terms very moderate. We aim to make our estimates accurate and our plans complete, so that when placed in the builder's hands no difficulty is experienced in the construction. Our work goes to all parts of the country and gives very general satisfaction. We shall be pleased to hear from those who contemplate building.

THE DUOMO OF FLORENCE.

The unveiling of the new facade of the Duomo of Florence on May 3 last marks the practical completion of this great building, which has been intermittently in progress during nearly six centuries. The present cathedral was begun in 1294, on the site of a small and ugly church, Arnolfo di Lapo being appointed chief constructor. After a few years of suspened operations, Giotto was made head master, but died after three years of superintendence, and was succeeded by Francisco Talenti (1357–76), by whom the plan was extended. The next great name associated with the enterprise is that of Brunelleschi, from whose model, chosen in competition with fifteen others, the eight-sided cupola was built. The new front just unveiled was also a competition design, prepared twenty years ago by De Fabris, who, like all his predecessors, died before the work he devised was completed. Since the death of De Fabris, the work has been carried on by his assistant, Del Moro. There still remain the gallery round the dome to be done, and the gates, for which a new competition is about to be invited.

DONATELLO.

Among those who contributed greatly to the decoration of the cathedral was Donatello.

Donatello, whose real name was Donato di Niccolo di Betto Bardi, was born in Forence, in the year 1386. The first place among architects is given to Brunelleschi, as founder of the renaissance in Florence and as the originator of a new period of architecture by the construction of the dome of the cathedral, but Donatello and Lorenzo Ghiberti are placed among the first representatives of the art of sculpture. This is not the place to enumerate Donatello's works in order to give a clear idea of his greatness, but we can mention one or two of his best known productions. Of these his statue of David, which is on the west side of the clock tower, comes first; then there were statues of John the Baptist, the penitent Magdalen, etc. By order of the different guilds he produced his statue of St. Mark, which so delighted Michael Angelo, of St. Peter, and St. George, which latter belongs to Donatello's best works. Much of his work is to be found in Padua, where he spent several years in ornamenting the altar of the church of St. Antonio.

Donatello died December 15, 1466, and was buried near his friend Cosimo de Medici in San Lorenzo, in Florence. Donatello's place in the history of art and the greatness of his name are founded on the influence which he exerted on Italian art of his time. To him is due not only the honor of ripening Florentine art for the production of the greatness of Michael Angelo, but also of inspiring the art of Northern Italy with new life. Our engravings are from the *Illustrirte Zeitung*.

Planers.

Goodell & Waters, of Philadelphia, the well known manufacturers of woodworking machinery, have just issued a very complete catalogue of planers, which is fully illustrated and printed in the best manner. It embraces nearly thirty varieties of planers, suitable for all purposes, from the finest cabinet work to the heaviest timber dressing.

Among the machines illustrated and described are the following: Pedestal jointer, jointer or hand planer, panel, pony, and finishing planers, single and double surfacers, planer and matcher, single and double surfacers and matchers, woodwork planers and matchers, flooring machines, endless bed planer, endless bed single and double surfacers, endless bed double surfacer with jointer head attached, endless bed planer and matcher, and timber planer.

This is, undoubtedly, the most complete catalogue of planers ever issued. They are also prepared to furnish planing knives of any description, and give directions for ordering. With branch houses in Chicago and San Francisco, they are enabled to fill orders in any part of this country promptly, and we would advise any of our readers who may be in need of woodworking machinery to address them at 3031 Chestnut Street, Philadelphia, for one of their catalogues.

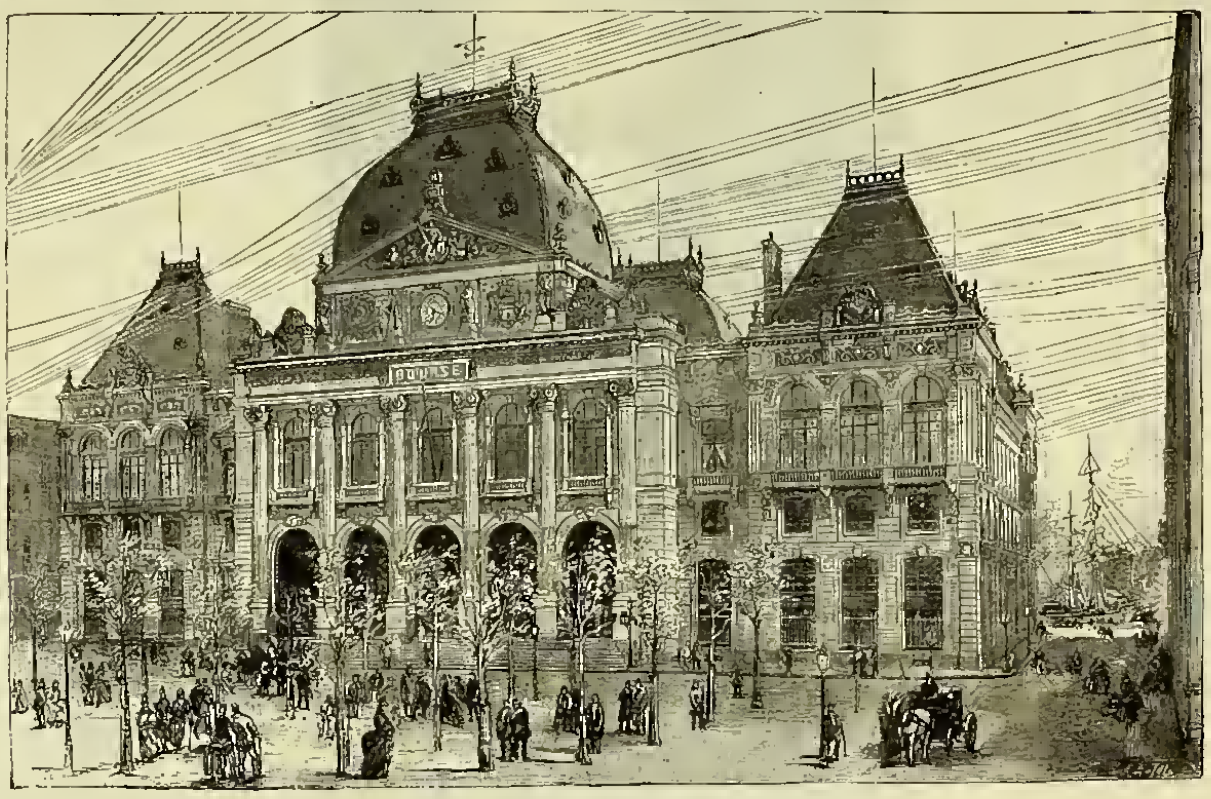
To remove candle grease from furniture without injuring the varnish, rub it off with a little warm water and a rag.

A RESIDENCE AT EAST ORANGE, N. J.

THE BOURSE AT HAVRE.

The active commercial city of Havre is at present enjoying the excitement of a great Maritime Exhibition. A large and splendid pavilion has been temporarily erected in the heart of the city, in which are collected almost every conceivable object pertaining to maritime industries. It is reported to be one of the finest and most interesting exhibitions of the kind ever realized.

We give an engraving of the Bourse or exchange at Havre, an imposing and elegant example of French architecture. The Maritime Exhibition is located not far from the Bourse.



THE BOURSE AT HAVRE, FRANCE.

IMPROVED CAMERA CLAMP AND TRIPOD HEAD.

The well known tripod screw for securing a camera firmly to the head of a tripod has many disadvantages, which have several times been pointed out, particularly when the camera is used in photographing architectural subjects. The object of the device shown in Figs. 1 and 2 of the engravings is to overcome the defects incident to the common screw clamp, by avoiding all separable parts and the wear of the screw thread, and at the same time to permit the camera to be easily and quickly secured to the tripod. A truncated cone shaped casting, having a projection provided with a socket or seat set flush with the top of the tripod head, is secured by screws to the under side of the head. The lower face of the casting is planed or filed off on a bevel. Passing through the hole drilled in its center is the fastening spindle, having a solid head turned on its upper end, and a thumb-actuated disk, held rigidly by suitable screws, at its lower end. The upper face of the disk is beveled to correspond with the bevel on the casting above.

Located in a slot in the spindle is a very light steel spring (see Fig. 2), which, in pressing against the walls of the hole, holds the spindle by friction, in any position, as it is elevated or depressed, and at the same time allows the spindle to be freely rotated. When the spindle is not secured to the camera, its head is drawn down into the seat in the upper face of the casting, so that nothing will project above the surface of the tripod head.

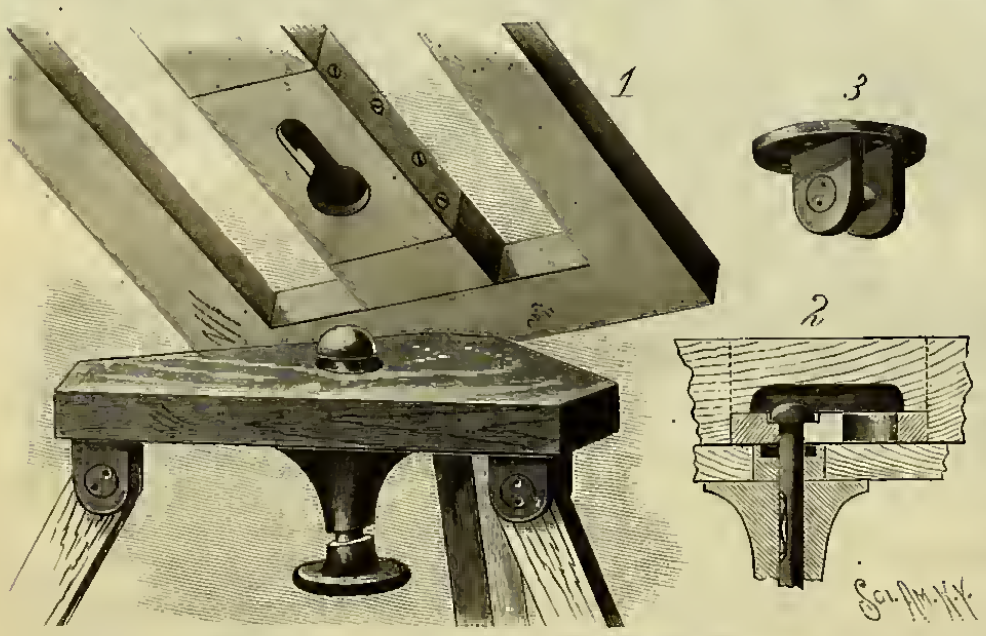
A light metal plate, having its ends bent up around the sides of the central bar of the camera bed frame and secured thereto by screws, as shown in Fig. 1, has a key hole slot in which the head of the spindle of the clamp fits. The wood of the camera bed is dug out back of this slot, forming a recess, as shown in Fig. 2. It will be noticed this method of fastening the plate to the camera bed frame secures unusual strength, since the pull on the screws is at right angles to their length. To prevent any possible slipping of the camera after it is secured, a slight depression is provided in the inner surface of the plate at the end opposite the entrance slot, clearly seen in Figs. 1 and 2.

To clamp the camera on the tripod head, it is only necessary to rotate the spindle by the thumb disk until the two beveled faces are parallel with each other, then to push the spindle upward until the faces meet, which leaves the spindle head projecting above the tripod head. When the camera is then set upon the tripod, the head of the spindle enters the key hole slot, and by a slight movement lengthwise the head is brought directly over the seat of the slot. By slightly rotating the spindle by the fingers with the thumb disk the beveled faces act upon each other like a cam, and at once draw down the spindle head into the seat of the key hole slot, firmly clamping the camera bed to the tripod head. A reverse movement allows the spindle to be pushed up, so that the camera may be quickly removed.

It will be observed that the clamp is very simple, effective, and strong, is, in fact, more durable than a screw, not liable to get out of order, and with it a camera can be very quickly adjusted to a tripod.

The inventor prefers the triangular form of a tripod head, made either of wood or vulcanized fiber, as shown in Fig. 1, and has the tripod legs rigidly secured thereto to avoid the wear and racking motion incident to detachable legs, which frequently occurs when photographing in a brisk wind. The fastening for the leg of the tripod is shown in Fig. 3, and consists of a round plate, provided with two projecting ears having a pin riveted between them, which passes through a hole in the extremity of the tripod leg. The plate is secured to the under side of the tripod head by screws. This construction makes a very rigid and steady bearing for the tripod head and camera. Both may be carried about on the shoulder without in any way straining the clamp.

Different sized cameras may be used on the one tripod head. The improved clamp may be fitted to any tripod head or camera. Further information may be had from the inventor, Mr. M. P. Warner, Holyoke, Mass., who is prepared to furnish the improved clamps and fit them to tripods.



WARNER'S CAMERA CLAMP AND TRIPOD HEAD.

JOINTS IN WOODWORK.

It would be an indubitable advantage in the construction of our buildings if framers and carpenters more generally understood the principles which govern the form of joints in woodwork. Many of the most important joints are commonly executed in a manner which is bad in workmanship and improper in form, and to prove the truth of this it will only be necessary to examine any of the less important of our buildings

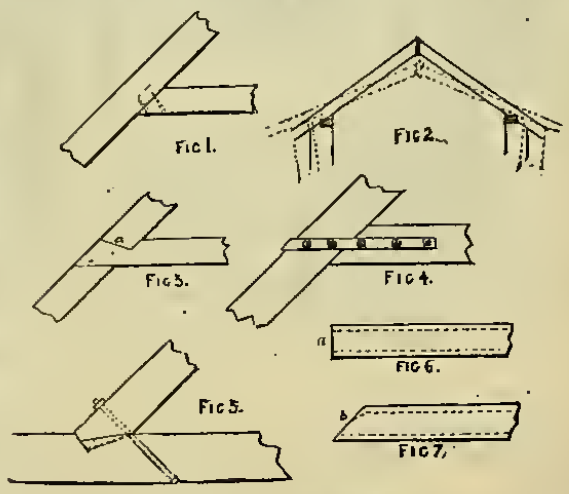
Professor Rankine, in his "Civil Engineering," and Tredgold, in his "Carpentry," have dealt with the subject of joints in a very comprehensive and thorough manner. The forms for various joints recommended by these authors are substantially the same, and are, to a considerable extent, followed in Europe. Here in America, joints in woodwork are generally executed in a much more crude and imperfect manner, even in the best work, where the form is, as a rule, simpler and less perfect.

The reason for this is not far to seek. In any country like this, where wood is abundant and labor expensive, the system of construction will be different from that used in countries where labor is comparatively cheap and timber dear. The effect will be to simplify the construction to a considerable extent, and to save labor in the execution so far as possible, even at the sacrifice of material. These conditions have had a considerable influence on the general forms of joints, with the result of producing a quantity of bad work. The question of the adoption of any particular form of wooden structure, which requires the use of more or less timber, with a corresponding loss or gain in the labor required upon it, will be simply determined by the local cost of labor and materials and the comparative loss or gain in the two items. But with joints the matter is different.

The strength of any structure must be as the strength of its weakest part, and in most wooden structures the joints necessarily form the weakest portions; so that if the strength of the joints is lessened by imperfect workmanship or improper form, the strength of the whole structure is thereby lessened in a corresponding degree. This has the effect of not only lowering the strength beyond safe limits, but of directly causing the absolute waste of a considerable quantity of material. For example: The members of an ordinary roof of some magnitude are usually much stronger than is actually required under normal conditions, the object being to provide for the effect of the pressure of high winds and for other emergencies which may arise. Some idea of the extent to which this is done may be obtained from the fact that, while it is usual to allow only 8 cwt. per square for the weight of slates and timbers, and much less for shingles and felting, as much as 36 cwt. per square is allowed as the probable wind pressure on the roof in times of gales and hurricanes.

Such emergencies are provided for by the use of timbers of sufficient size to resist such force, should it be applied. But if, in joining these timbers together, the connections are badly, carelessly, or improperly formed, the full strength of the timbers can never come into play at all; for if a very high wind take place, the joints will fail under the exertion of a force much less than the roof would safely carry with such timbers properly jointed.

In determining the form of a joint, it should be striven to produce a strength as near to that of the solid piece as is practicable. Rankine, in his work before referred to, lays down a number of rules upon which the form of a joint depends, and the reader interested in the subject will do well to refer thereto.



JOINTS IN WOODWORK.

For our present purpose we can consider that the following points chiefly determine such form: (1) The direction of the load; (2) the description of the load; and (3) the nature of the materials to be joined.

As characteristic examples we will consider two cases. In the first place, the joint used in connecting a collar to the rafter in a collar-beam roof. The description of strain here is important, as strictly determining the form of joint. Occasionally a carpenter is found

who is under the impression that as the effect of the weight on the roof is to cause the rafters to sag to some extent, the collar must be subjected to a direct compressive strain, and that the best joint is a butting one, as shown in Fig. 1. This is altogether wrong. The only possible condition under which the collar could be compressed is where the feet of the rafters are immovable, and even then (a condition impossible to produce in practice) the sagging, and consequently the pressure upon the collar, could not be more than would result from the very slight lengthening of the timber due to the elasticity of the material.

The strain to which any member of a roof truss or other simple structure is subjected may always be found by determining the manner in which such structure, if overloaded, would fail. Thus in the present case the effect of an overload would be to throw the rafters out, as shown by dotted lines in the case of a single pair of rafters in Fig. 2. The effect of a load, even that of the weight of the timber composing the roof, would be to *tend* to throw out the rafters in the same direction. The object of the collar, then, is to simply tie the two rafters together, and prevent them spreading out, and the collar is therefore clearly subjected to a tensile or pulling strain.

It is apparent that, such being the strain, the butting form of joint, before referred to and shown in Fig. 1, would be almost useless, and would in fact depend for its strength entirely upon the adhesion of the nails joining the two parts. Nevertheless, partly from ignorance, this joint is used, and very frequently, even where the strain is understood, to save labor the collar is simply nailed upon the side of the beams.

The proper form of this joint is that shown in Fig. 3, in which a portion, usually about one third of the depth, is cut away and the collar halved on and pinned in place. The inclined edge, *a*, prevents the piece from being withdrawn, and hence effectually resists the strain. Sometimes this joint is formed by fitting the collar on the rafter with a tenon, and connecting it with an iron strap, as shown in Fig. 4; but this construction is only employed in roofs of large span.

The form of joint, if such it can be called, shown in Fig. 1, although not infrequent, is a fair example of the manner in which timber may be wasted by bad construction, for the sake of saving a little labor. Can it be doubted that this is very far from true economy?

As an example of strains unlike those just referred to, we will take the case of the joint between the foot of the principal rafter and tie beam of a king post roof truss. There is the same tendency here for the rafters to separate as in the preceding case, and the effect is to throw the tie beam strongly into tension, and the strain on the joint will be a compressive one. The load being communicated to the tie beam by the rafter at an acute angle, a special provision is necessary in forming the joint. The most important point is to form the butting surfaces at right angles to the thrust, and this is provided for by letting the rafter into the tie beam, as shown in Fig. 6. Then, as there is some tendency for the rafter to slip out of its place, a tenon is provided, forming the joint usually termed the shouldered tenon, as shown in Fig. 5. There is a tendency, too, for the rafter to rise out of its place, and, to prevent this, a bolt is passed through the two, or in large trusses an iron strap is placed around, to embrace the two and keep them from separating. Other forms of this joint are sometimes employed, some having two tenons and others two bearing surfaces, but their use is limited. It is not necessary to illustrate here the various bad and ill considered forms of this joint in common use. The example in Fig. 5 is the simplest form which should be allowed, even in unimportant work.

In the proper construction of this joint, it is obviously important to place the end of the rafter far enough back from the end of the tie-beam to prevent detrusion or splitting off of the wood. Hurst gives the following rule for finding the distance: Let *a c* equal the required distance in inches; B equal breadth of tie beam in inches; H equal horizontal thrust in pounds; and S the cohesive strength of a square inch of the material.

$$\text{Then A. C.} = \frac{4H}{BS}.$$

The time occupied in the execution of this joint is, of course, somewhat long, but it is of so much importance (for the whole stability of the roof depends upon it) that the inferior forms so often seen, some without tenons at all, others without straps, would never be adopted by a good workman.

A consideration of the nature of the material to be jointed is of importance in determining the description of joint to be used. The most important characteristic, so far as the question of joints is concerned, is the manner in which it shrinks. It may be taken as a fact that any alteration in the length of a piece of timber by shrinkage is inappreciable, but the shrinkage in the direction of its width is considerable. This fact will have an important bearing on the form and execution of joints. If a piece of timber be cut off at the end at right angles, it will, on shrinking, still retain the same shape. If the end be cut at an angle, the effect of shrinkage will be to make the angle more acute. In other words, let the full lines in Figs. 6 and 7 represent pieces of timber cut at right angles and obliquely, respectively, as shown. When the timber shrinks to the position shown by dotted lines, the end *a* will be unaltered in shape, but still retain its end perpendicular with the body; while the end *b*, shrinking in the same manner, will be altered, becoming more acute, as shown by dotted lines in the figure. Framers should remember these facts, and make allowances for the alteration in shape, and especially when working upon timber unusually sappy.

When a joint is not quite true, it is usual to run a saw-cut between the abutments, to produce a better bearing; but as timber all shrinks to some extent, it is well not to make the abutments fit too closely at first, provided always that the inequality is properly allowed to be compensated by the subsequent alteration in form which will take place from the shrinkage, as explained.—*Artus, in the American Architect.*

WHEELER'S PATENT WOOD FILLER.

In the SCIENTIFIC AMERICAN of March 12 we mentioned another decision in favor of the Bridgeport Wood Finishing Co., further establishing their patent upon Wheeler's wood filler, rendered in the United States Circuit Court, Boston, Judge Colt entering a final decision in their suit *vs.* Asahel Wheeler in equity. This decree affirms the validity of the Wheeler patent, and restrains infringement thereof by the use of ground silex in wood fillers.

The various goods manufactured by this company have long been noted for their excellent qualities, and it gives us great satisfaction to know that we have largely assisted in introducing them to distant countries. Among many letters received by the manufacturers is the following:

OFFICE OF SUPT. OF WORKS, SIMLA IMPERIAL CIRCLE,
SIMLA, March 28, 1887.

BRIDGEPORT WOOD FINISHING CO., New Milford, Ct.:

SIRS: I learn from an advertisement in the SCIENTIFIC AMERICAN that you are the manufacturers of Wheeler's patent wood filler, an article I have heard praised. I shall feel much obliged by your sending me particulars of it, and any preparations for wood finishing that you manufacture. We shall shortly have a large quantity of woodwork to do in the interior fittings, furniture, and decorations of the new viceregal palace here, and I am anxious to learn of all labor saving processes and preparations that are in the market.

Our woods are chiefly teak, which is imported from Burma, walnut, box, took, and Himalaya oak, which grows in the neighborhood, besides the cedars and pine. You will also oblige by stating your agents or where your preparations may be obtained in the United Kingdom. I remain, sirs, yours faithfully,

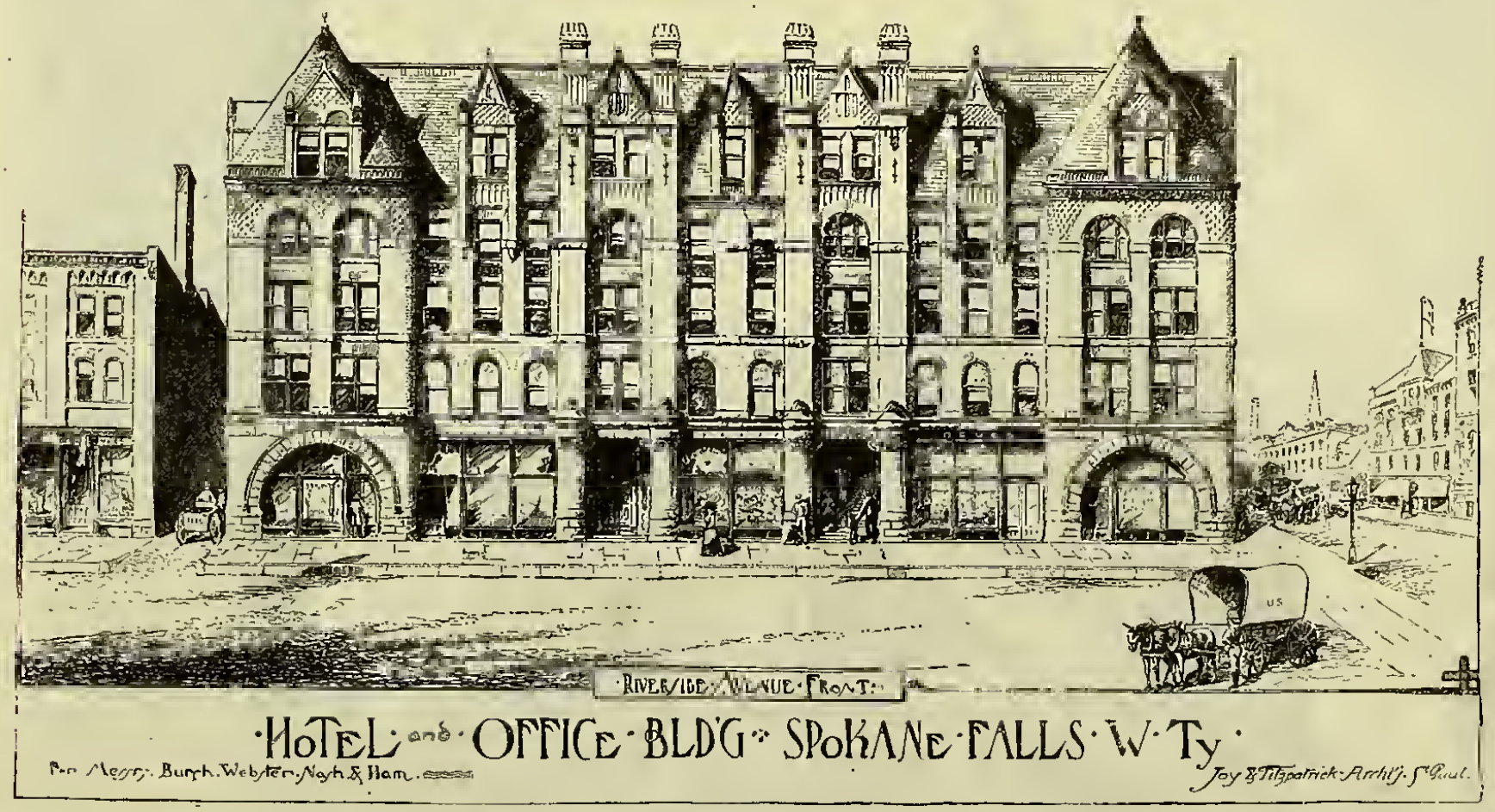
L. M. ST. CLAIR,
Executive Engineer and Supt. of Works,
Simla Imperial Circle.

We congratulate the Bridgeport Wood Finishing Co. upon this letter, and have no doubt but they will receive the order, as their goods are well made and reliable. Their works are situated at New Milford, Conn., on the Housatonic Railroad, thirty-five miles north of Bridgeport. The raw material from which their products are principally made is found in the immediate vicinity of their mills. Their plant consists of silex mill, wood filler factory, paint factory, storage and packing warehouse, barrel factory, and japan and stain factory. All these buildings are located separate, so that in case of fire one will not endanger another.

Besides manufacturing the Wheeler's patent wood filler, they are also largely engaged in manufacturing silex and feldspar, producing it of various grades of fineness, from coarse grains to impalpable powder, and for various purposes, such as making porcelain, scouring soap, sandpaper, etc.

Among the other products are Breinig's lithogen silicate paint, and Breinig's lithogen primer, and Breinig's white japan, drier, wood dyes and stain, all of which are giving general satisfaction and are meeting with large sales.

Readers who are in need of any of these articles should address the Bridgeport Wood Finishing Co., New Milford, Conn., who will be pleased to send illustrated catalogue and full particulars upon application.


RIVERSIDE AVENUE FRONT.
HOTEL and OFFICE BLD'G SPOKANE FALLS W. Ty.
For Messrs. Burch, Webster, Nash & Ham.
Joy & Fitzpatrick Archt's St Paul.

RIVERSIDE AVENUE, SPOKANE FALLS.

The marvelous growth and development of the great West is well exemplified in the sketch we give, from the *Northwestern Architect*, of the substantial hotel and office buildings on Riverside Avenue, Spokane Falls, Washington Territory. Messrs. Joy & Fitzgerald, of St. Paul, Minn., were the architects.

THE NEW FRONT OF THE DUOMO, FLORENCE.

[For description see page 9.]

A RESIDENCE AT FLATBUSH, N. Y.

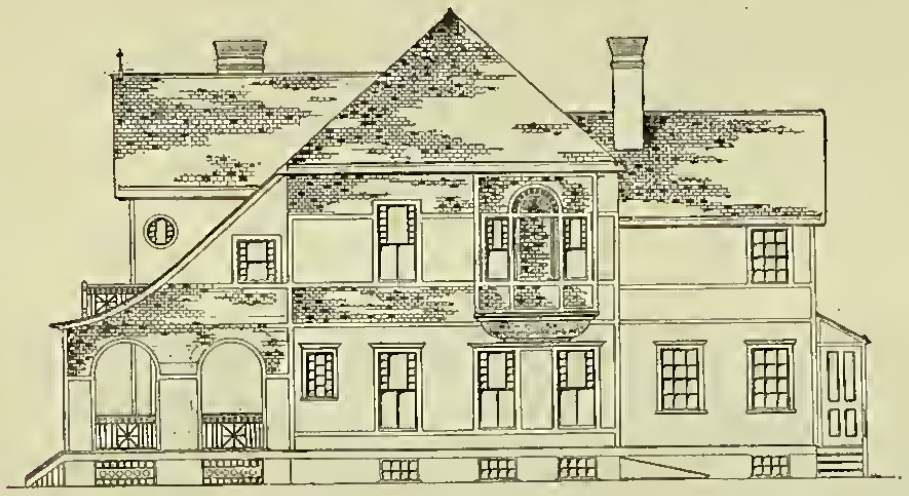
We give beneath the floor plans and elevations of a very comfortable dwelling at Flatbush, N. Y., erected for Mr. Martin by H. L. Harris, architect, of this city. The cost of the house was $3,700. The general style of the building is substantial and pleasing.

Preventive for Dry Rot.

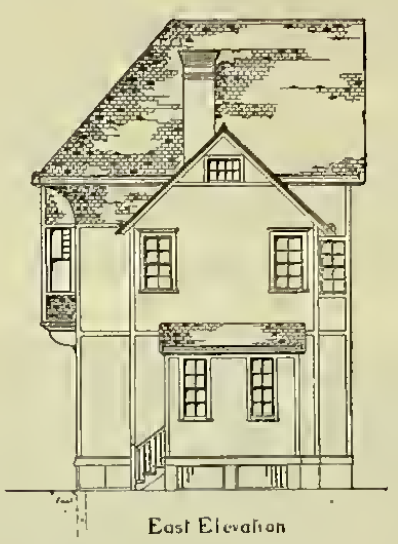
A Bohemian chemist has found that salicylic acid is a preventive and a cure for dry rot. At first the acid was used in the dry or powder form, but latterly the greatest success has been achieved, according to Prof. Farksky, by dissolving 5¼ ounces of salicylic acid in one quart of common spirit, and diluting this solution to a convenient degree with water at the moment of using it. In some of the old houses of Bohemia dry rot is a very dangerous thing, especially when it attacks the principal beams, which are mostly of beech wood.

Great California Dam.

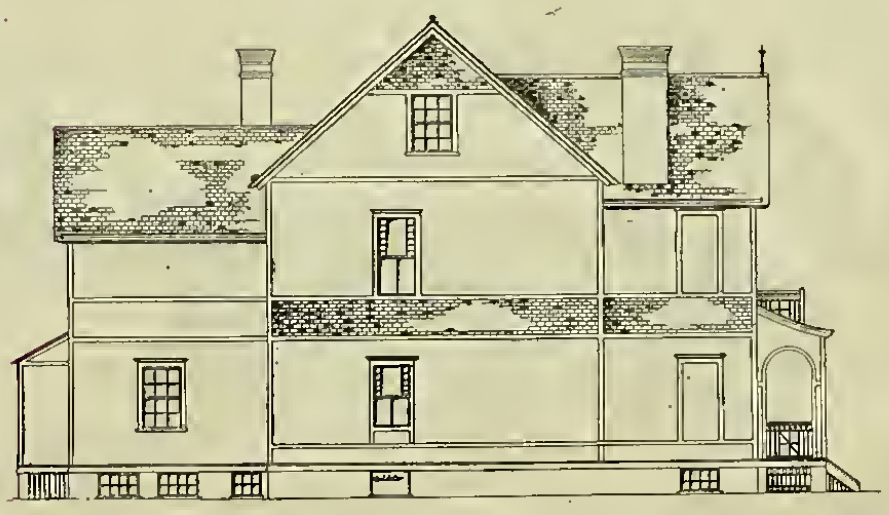
A remarkable dam is about to be constructed by a water company at the San Mateo Canyon, four miles from San Mateo, Cal., in order to form a reservoir. The canyon is very narrow and steep, and 15 ft. below the bottom is a solid rock on which the foundation of the dam will rest. The structure will be 170 ft. high, 175 ft. wide at base, 20 ft. at the top, and 700 ft. in length. It will be the largest stone dam ever known to have been built. The dike will have a curvature of eighty feet, and the convex side will be upstream. The material will be a new sort of concrete, composed of stones. The walls will be perfectly smooth. The reservoir that will be formed by it and the adjacent hills will be about eight miles in length and 150 ft. deep in the deepest places. Its capacity will be about 32,000,000,000 gallons. The water will be conveyed by tunnels to the city of San Francisco.—*Boston Journal.*



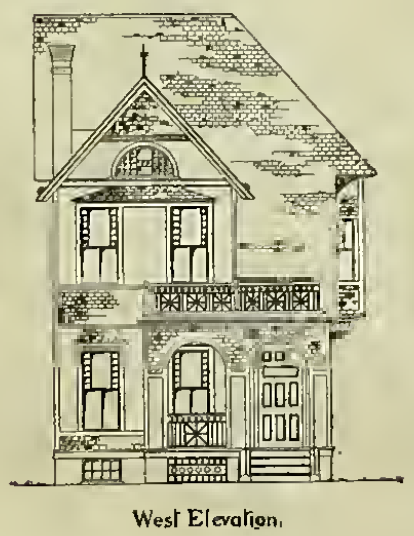
South Elevation



East Elevation



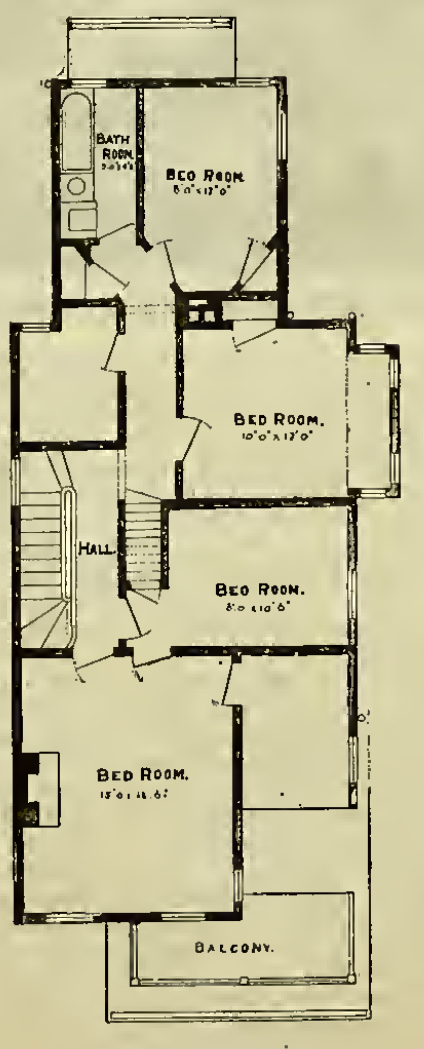
North Elevation.



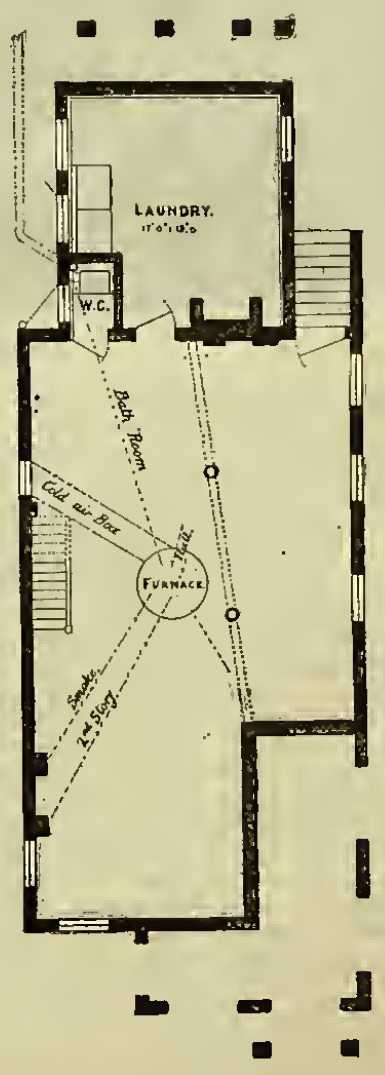
West Elevation.

First Floor.

Scale of feet.



Second Floor.



Cellar.

A RESIDENCE AT FLATBUSH, N. Y.

THE MANCHESTER JUBILEE EXHIBITION.

On May 3 last this exhibition was opened by their Royal Highnesses the Prince and Princess of Wales, under favorable auspices.

The *Engineer*, from which we take the following particulars, says: In many respects the exhibition is superior, not only in extent, but in variety, to anything that has been seen in England for several years. All the conditions are favorable to its success, for it possesses those elements of attraction which have been found so popular in London, inasmuch as it closely adjoins the botanic gardens, and as these will be thrown open to the visitors, it will be easy to provide open air attractions of no common order of merit.

The contents of the great machinery gallery fully maintain not only the reputation of Manchester, but of England. Never, since 1862, has anything like the display of textile machinery been seen within our shores.

The main building of the exhibition claims the special attention of all who are interested in iron structures. It is a remarkable example of the adaptation of means to an end.

The architects of the building are Messrs. Maxwell & Tuke.

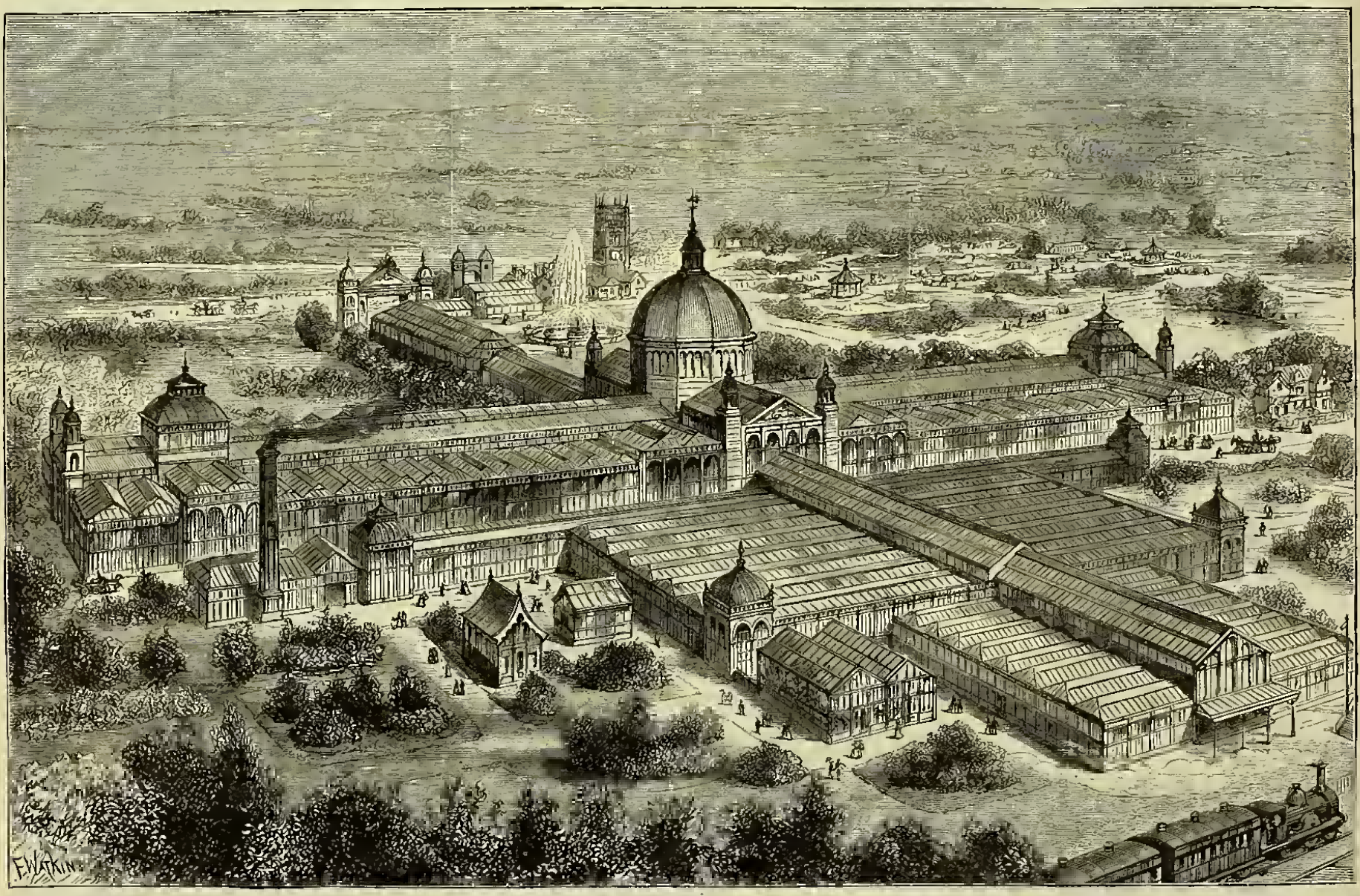
will be referred to in a future notice, but almost all of such a character as to show great excellence of workmanship and design. The large annex on the south side of the main building is almost wholly occupied by machinery at rest and in motion. This area is separated from the main building by Talbot road, across which is carried a foot bridge of 70 ft. span, which is used by all visitors arriving by rail at the exhibition station. In addition to the botanic gardens, there is a considerable area available for open air recreation. This ground is situated for the most part near Talbot road, and it contains detached buildings, notably a creamery, conservatories, billiard room, and smoking room. The proximity of the botanic gardens, as a matter of course, suggested the provision of all the accessories which made the fisheries and the other recent exhibitions at South Kensington so enjoyable as a summer resort. The grounds have been rearranged to a great extent. A wide promenade has been formed, with a band stand at each end, and, as we have said, a magnificent fountain has been provided for display with electric light.

The roofs of the exhibition building contain several features of a novel kind. The architects have shown considerable ingenuity in using those forms and sec-

These are passed through a purlin coupling of cast iron, and are fixed in position by nuts, which are tapped to fit the screw of the water pipe.

Most of the tie rods also are made of small iron water pipes, and these are attached at the ends in a simple but effective way. A piece of flat bar iron is punched with a hole in the center and a hole at each end. The bar is then bent twice at right angles, bringing the ends into proximity, so that any number of flat bars can be gripped and a bolt passed through the whole thickness. The end of the tubular tie rod is then passed through the center hole in the strap, and a nut is screwed on the end of the pipe, by which the whole can be drawn tightly together. It will be seen from the drawings that the suspending rods are also made of drawn tubes, and are attached to the tie rods by ordinary T pieces or junctions. The clustered columns are secured to the brick foundation by being bolted down to a cast iron bed plate of 1¼ in. thick. The heads of the bolts are countersunk so as to insure a uniform bearing on the brickwork, and the bed plates are secured by holding down bolts, which are built into the brickwork.

In the roofs of the low main buildings, not only are all the members which are in tension made of drawn



THE MANCHESTER ROYAL JUBILEE EXHIBITION—GENERAL VIEW.

The principal building consists of a nave or main avenue, 1,000 ft. long, crossed at the middle point by transepts, surmounted by a graceful dome, which is finished above by a well proportioned lantern. Near to the ends of the nave are situated two pavilions, which rise to a considerable height above the nave roof, making with the dome a pleasing sky line, not usually found in exhibition buildings. The interior of the building when viewed from one end presents a very satisfactory vista. The nave has a total width of 100 ft., but as the sides are partitioned off to form rows for the display of furniture and other matters, the visible width of the main avenue is only 60 ft. The dome is 90 ft. in diameter, and is supported, as, indeed, is most of the roof covering, by slender clustered iron columns. The approach avenue from the royal entrance in Old Trafford road forms a most imposing corridor. It is 600 ft. long, and is covered in for its entire extent. There is a broad causeway down the center, and on each side there is a wide margin planted with exotic ferns, palms, and other foliage plants, which, as a whole, presents a feature that for luxuriance of vegetation is almost unique. This covered road is lighted after dark by electric arc lights, with excellent effect. Both north and south of the main building there is a vast covered area of ground, where the aim has been to afford protection for machinery and other exhibits, rather than to satisfy the eye by architectural effect. A special area of large extent has been devoted on the north side of the nave to the Irish section, which is well filled with exhibits of various kinds, some of which

tions of iron that are commonly found in the market. By doing so the delay consequent upon the adoption of special designs has been avoided, for with the exception of some small castings of a special form, every portion of the roof could be procured in any desired quantity. The adoption of the ordinary forms of iron has, of course, been attended with economy in two respects. The material was doubtless cheaper at first cost, and if the building is to be taken down when its present purpose is served, the greater part of the material will be available for the purposes for which it was originally made.

The whole of the columns are built up of flanged pipes of 4 in. interior diameter, having a thickness of ½ in. and flanges of ¾ in. faced. They are placed in groups of two, three, and four, and have a very light and elegant effect. Between the flanges are fixed cast iron zones, which are beaded round the edge, and as they project a little beyond the outer edge of the flange, they almost entirely conceal the fact that so untilitarian a material as a steam pipe has been employed. These zones have a further use in some situations, as they are then cast with a lug, to which is attached any tie or bracing that is required. Ordinary angle and T iron is largely used, and it will be seen by the drawings that hardly any smiths' work has been necessary. The labor has consisted almost entirely of shearing, punching, and riveting. The arrangement of the purlins is both simple and sound in construction. They are, for the most part made of wrought iron water pipes screwed in the usual way at each end.

pipes, but the rafters and purlins are of the same class of material. The struts are of angle iron, and are attached to the purlin couplings by rivets. The shoes of the principals, and what answers for a ridge piece, are made of flat bar iron punched and formed to a suitable shape to receive the ends of the pipes, which are attached with nuts, as above described, for the tie rods. The dome, which is twelve sided in plan, is of graceful form, and is very light in construction Each rib is made up of two T irons, which are tied together by ordinary diagonal bracing of angle iron 2 in. × 2 in. × ⅜, each having a single rivet at each end. No pipes have been employed in this part of the structure, but the necessary ties are of steel wire rope, which is so light as to be hardly visible from the floor of the building. There are two complete sets of tire wires which cross the dome horizontally, but diagonally, as shown on the plan of the lantern, touching each other as they pass.

The buildings are, with very few exceptions, covered with corrugated iron, and no other material is used with it, except in the music room, at the eastern end of the building, where the inside of both roof and walls is lined with thin boarding, which, for obvious reasons, is more suitable than galvanized iron and ordinary brickwork.

The exhibition buildings are situated at some distance from the center of the city, but there are ample facilities provided for reaching it by both road and rail. The principal or, as it is called, the royal entrance is in Chester road, a few yards from the gates

of the botanic gardens. The exhibition is divided into two sections by Chester road, a thoroughfare 70 ft. wide. On the north side is the main building, on the south the great machinery hall, 510 ft. long and 210 ft. wide. This will be devoted to machinery in motion. Opening off it, still to the south, is an annex 180 ft. square for machinery at rest. The entire building is, as we have already stated, lighted by electricity. The contract for the whole of the arc lighting has been placed with the Anglo-American Brush Electric Light Corporation. The total number of lamps employed is 546, exclusive of those required for the private use of exhibitors. All the lamps are of the Brush standard pattern, working with a current of 10 amperes, and are maintained by twenty-six dynamos, inclusive of spare machines. The engines employed to drive the dynamos are by Messrs. Robey, Hornsby, Davey Paxman, Ruston Proctor, and Yates, and are arranged to suit the requirements of the several circuits as nearly as possible.

Our two sketches of the exhibition buildings are from the *Illustrated London News*, from which we also take the following:

A very interesting feature of this exhibition is the architectural reproduction of "Old Manchester and Salford," erected on the large lawn on the northern side of the botanical gardens, between the ordinary entrance to the gardens and the grand entrance to the exhibition in Chester road. The task of design was entrusted by the executive committee to Messrs. Alfred Darbyshire, F.I.B.A., and F. Bennett Smith, architects. From the set of drawings which they prepared, models in plaster were made by Mr. Hindshaw, and were colored by the architects for the guidance of the scenic artists. The general contract for the construction of buildings was taken by Messrs. R. Neill & Sons. All the lead lights and stained glass windows were provided free of charge by Messrs. Edmundson & Son. The committee secured the services of Mr. Walter Hann for the artistic painting. The result will be admired by all visitors to the exhibition. "Old Manchester" is entered through a Roman arch, flanked by two circular towers, presumed to represent the Porta Decumana of the ancient Mancunium, with a tablet bearing the names of the Emperor Domitian and of Agricola. The names of Roman legions and cohorts which garrisoned Mancunium are inscribed on the wall. Fine beech trees overhang this representation of historical antiquity. The interior contains faithful imitations of many old buildings that formerly existed in the town and suburbs; characteristic examples of domestic architecture in the Tudor period, in the seventeenth century, and in the early part of the Georgian era. Our sketches are those of Market Sted lane, with its timber framed houses, one of which—"The Palace"—was the lodging of the Young Pretender in 1745; the Cheetham College, which still remains; Hulme Hall, as the model is viewed from the gardens; and Ancoats Hall, with the tower of the old church, as seen together from the entrance by the Roman arch, of which also we give an illustration. The Prince of Wales during his sojourn was the guest of Lord Egerton, of Tatton Park. Fifteen miles south of Manchester, in Cheshire, is the quiet little town of Knutsford, to which there is a pleasant walk, from Altrincham, by the beautiful "mere" or small lake of Rostherne, and through Tatton Park. This rural part of the country presents an agreeable aspect of soft verdure with clear streams, unlike anything on the Lancashire side of Manchester. There are several noble parks, those of Dunham Massey, Tatton, and Tabley, adorned with clusters and avenues of fine trees, and inhabited by herds of deer. Tatton Park is the largest, being ten miles in circumference, and contains one or two meres, the grassy margins of which are refreshing to the eye. The mansion is a handsome building of white stone, with a Grecian portico, erected from Wyatt's design by Mr. Wilbraham Egerton. Its next owner, his son, was raised to the peerage in 1859, having been M.P. for a division of the county twenty-six years; he was also Lord Lieutenant of Cheshire. His lordship died in 1883, and was succeeded by his son, the Right Hon. Wilbraham Egerton, the second Lord Egerton of Tatton, who was born in 1832, and who likewise had sat in the House of Commons, for North Cheshire and Mid Cheshire, from 1858 until his accession to the barony; he is married to a daughter of the second Earl Amherst, but has no son; and his brother, the Hon. Alan de Tatton, is heir presumptive to the title. Tatton originally belonged to a family of that name, from whom it passed by marriages to the Masseys, the Stanleys, the Breretons, and to Sir Thomas Egerton, Lord Chancellor in the reign of James I., ancestor of the Earls and Dukes of Bridgewater, the Earls of Ellesmere, and the Egertons of Tatton.

From the *London Graphic* we take some illustrations of Tatton mansion, where the Prince and Princess of Wales sojourned during their stay in the vicinity of Manchester. The *Graphic* says: Tatton Park, the seat of Lord Egerton of Tatton, where the Prince of Wales has just been a guest, is situated about three miles from Knutsford and six from Altrincham, in the County of Cheshire. Although the surrounding country cannot be said to be particularly picturesque, yet the park, of some four thousand acres, is well diversified with hill and dale, and planted with fine groups of trees, some of which are evidently of considerable antiquity. There are, moreover, two large lakes and several ponds, which add greatly to its attractiveness.

The mansion is situated upon an eminence, from which the ground declines to the south. This decline was formerly covered by one of those monotonous sloping lawns so beloved of "Capability" Brown and other English landscape gardeners of the last century, but has just been cut into terraces and gardens by the present Lord Egerton. At the foot of this decline is a thick grove of yews, cypresses, and other evergreen trees, whose dark foliage forms a pleasing contrast to the white balustrades, urns, and fountains of the terraces. Beyond this grove most delightful gardens spread away to the banks of a charming lake with islands, rustic bridges, and a little temple erected in imitation of the Choragic monument at Athens. The late Sir John Paxton greatly improved this portion of the estate, and his genius for this kind of landscape gardening seems to have had a good opportunity of displaying itself here. There is a larger lake further away from the house toward the southern end of the park.

The mansion itself is for the most part—at least, externally—an erection of the elder Wyatt's, who built or rebuilt so many noblemen's houses during the reign of George III. It is of stone, and in the cold and formal, though dignified, classical style in vogue during the latter half of the last century. The south front has a Corinthian portico and plainly treated wings, forming its main features. A lower kind of wing, adorned with a double colonnade, stretches away to the west, and conceals externally portions of an earlier house dating from the time of Charles II. The north front of the house, also by Wyatt, must until recently have presented a somewhat dreary appearance, as it is unadorned with either portico or pilasters. It has, however, been greatly improved of late by the present Lord Egerton, who has added a forecourt, approached by large ornamental iron gates in the center, opposite to the chief entrance of the house, and two pedimented gateways at right angles to it, that to the left leading into the garden, and that to the right to the usual entrance of the house, the offices, etc. Beyond this gateway is seen the pretty apse and *flèche* of the new chapel, another of the additions by Lord Egerton. Entering the house through the principal doorway, one is admitted into a spacious hall subdivided into three parts by columns. This is really strikingly treated, and is the best work executed by Wyatt at Tatton. There appears to be distinct evidence that it was from Wyatt's designs, or one would feel inclined to doubt the matter. The inner hall, with the principal staircase, is also handsome, but the little side staircase, recently brought from the decayed old mansion at Hough's End, and re-erected here by Lord Egerton, is far more attractive to the artist. It is called Queen Elizabeth's staircase, because, when the old mansion at Hough's End was first erected, Queen Elizabeth honored it with a visit in recognition of some services which its proprietor had afforded in the way of collecting arms and supplies to resist the Spanish Armada.

Wyatt seems to have made such very extensive alterations at Tatton Park that nothing is now visible of the old mansion of Charles II.'s date except the dining room. This is, however, a good example of its style, with excellently carved panels, wreaths, and arabesques somewhat French in character. Of the more modern apartments, the library, which has been al

THE MANCHESTER ROYAL JUBILEE EXHIBITION—THE CENTRAL DOME.

most reconstructed by the present Lord Egerton, is the most elegant. The chapel, which is at present unfinished internally, will be very handsome.

The whole house is lit by electric light. A group of buildings, situated near the western wing, and consisting of conservatories, orchid house, aviary, and a large fernery, deserves to be noticed. The fernery is said to be the largest attached to any private house in the country, and is most beautifully laid out with paths, ornamental water works, rock work, and planted with superb examples of ferns of every description, with here and there a palm tree.

About half a mile from the present house, situated in the park, are the remains of old Tatton Hall. It appears to have been a fine old Gothic mansion of red brick, but has been very much curtailed as to its dimensions, and altered to convert it into three separate dwelling houses, so that, externally, there is little to give one any idea of its former magnificence. That it must, however, have been a grand old mansion is proved by the fact that in the loft over one of the houses are to be seen the remains of an early perpendicular roof of singular beauty and unusual span, which must evidently have formed a portion of the great hall of the house, and, from its remarkable elaboration and great size, suggests the idea of a very noble apartment. Unfortunately, a modern floor cuts it off some four feet below the wall plate, and, in order to convert the lower portions of this hall into dwelling rooms, every vestige except this roof is concealed from view. The roof would seem to date from about the time of Henry VI., and is certainly one of the most elaborate examples of domestic architecture of that period in existence. The old mansion is known to have been in use as late as the time of Elizabeth, and in all probability was so down to the erection of the present mansion in the time of Charles II.

Light violet with black trimmings is the new color of Mr. G. W. Childs' cottage at Long Branch.

Plumbing and Drainage.

The Common Council of Providence, R. I., has passed a bill regulating plumbing and drainage, as follows:

Section 1. The inspector of buildings shall inspect the drainage within the outside walls and the plumbing of all buildings hereafter erected in the city of Providence, except as herein otherwise provided.

Sec. 2. The Board of Public Works shall transmit to the inspector of buildings the names of all persons licensed to carry on the business of plumbing or drain laying, together with the location of their respective places of business, and notice of any change in the place of business of a licensed plumber or drain layer shall be immediately given to said inspector by said Board of Public Works.

Sec. 3. When any building is to be connected with a public sewer, the drain from the sewer to the point where it enters the cellar or passes above ground shall be inspected by the inspector appointed by the Board of Public Works.

Sec. 4. No work shall be done upon the drainage or plumbing of any building hereafter erected in the city of Providence, until plans fully showing the entire drainage and plumbing of the building shall be first filed in the office of the inspector of buildings, and be approved in writing by said inspector.

Sec. 5. Soil and waste pipes and their branches shall be of iron or lead. Wooden spouts or sheet metal pipes shall not be used for carrying sewage. All soil pipes and all waste pipes not connected with soil pipes shall be extended full bore above the roof without return bend, to such a height as the inspector of buildings may designate. When lead pipe is used for waste pipe, it shall not be lighter than the following weights per lineal foot, viz.: One and one-quarter inches, two and one-quarter pounds; one and one-half inches, two and one-half pounds; two inches, four pounds; three inches, five pounds; and four inches, eight pounds per lineal foot.

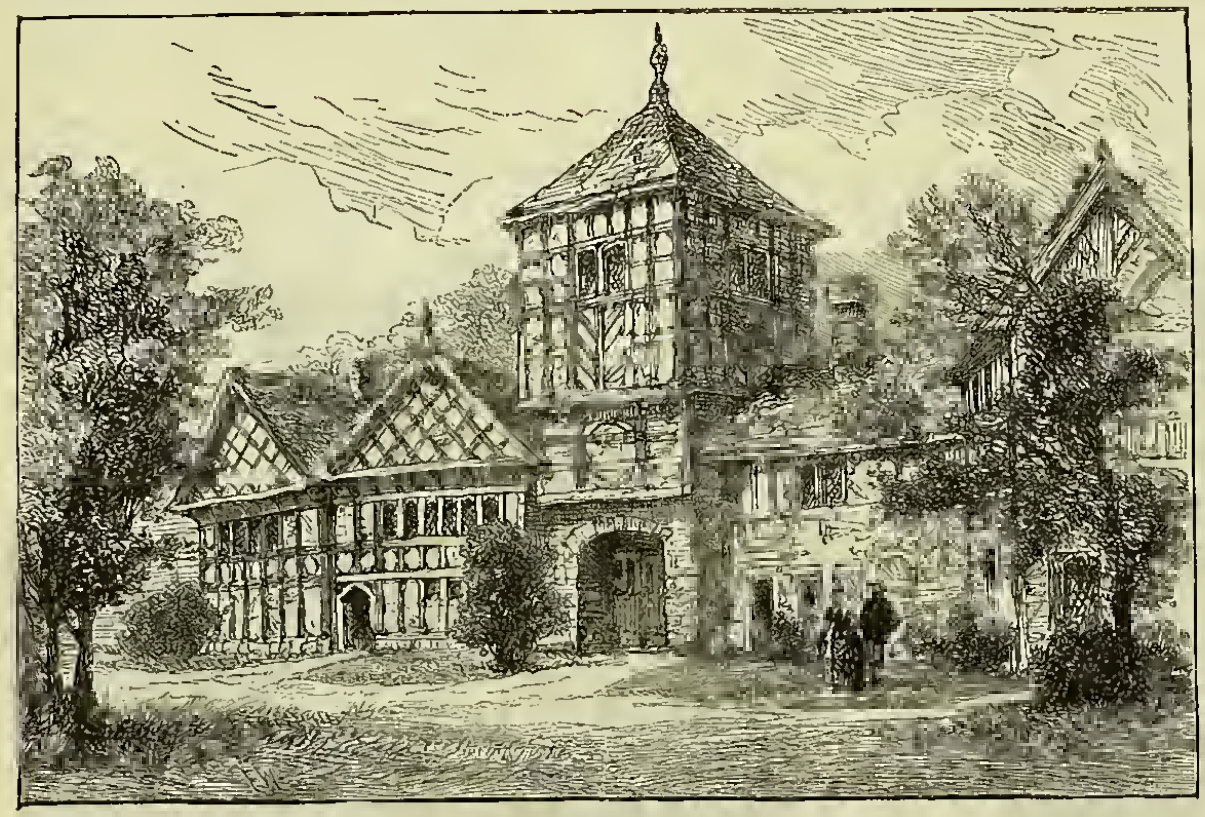
Sec. 6. All drain pipes when within a building and for five feet outside the foundation wall thereof shall be of iron, and connection shall be made with the sewer through drain pipes of iron, cement, or earthenware. Iron pipes shall be sound, and those above ground of a uniform thickness of not less than one-eighth of an inch for a diameter of four inches or less, of five thirty-seconds of an inch for a diameter of five or six inches, and with a proportional increase of thickness for greater diameters. Iron pipes under ground shall be of not less than the following weight per lineal foot, viz.: Two inches, five and one half pounds; three inches, nine and one-half pounds; four inches, thirteen pounds; five inches, seventeen pounds; six inches, twenty pounds, with a proportional increase of weight for greater diameters.

Sec. 7. Iron pipes, before being put in place, shall be coated inside and out with coal tar pitch, applied hot, or with paint, or with some equivalent substance. Joints shall be run with molten lead and thoroughly calked and made tight. Connections of lead pipes shall be made with brass ferrules, properly soldered and calked to the iron. In all iron and earthenware pipes, changes in direction shall be made with curved pipes, and connections with horizontal pipes shall be made with Y branches.

Sec. 8. Earthenware pipes shall be of the best glazed pipe, and all joints shall be made with Portland or hydraulic cement and sand mixed in equal quantities.

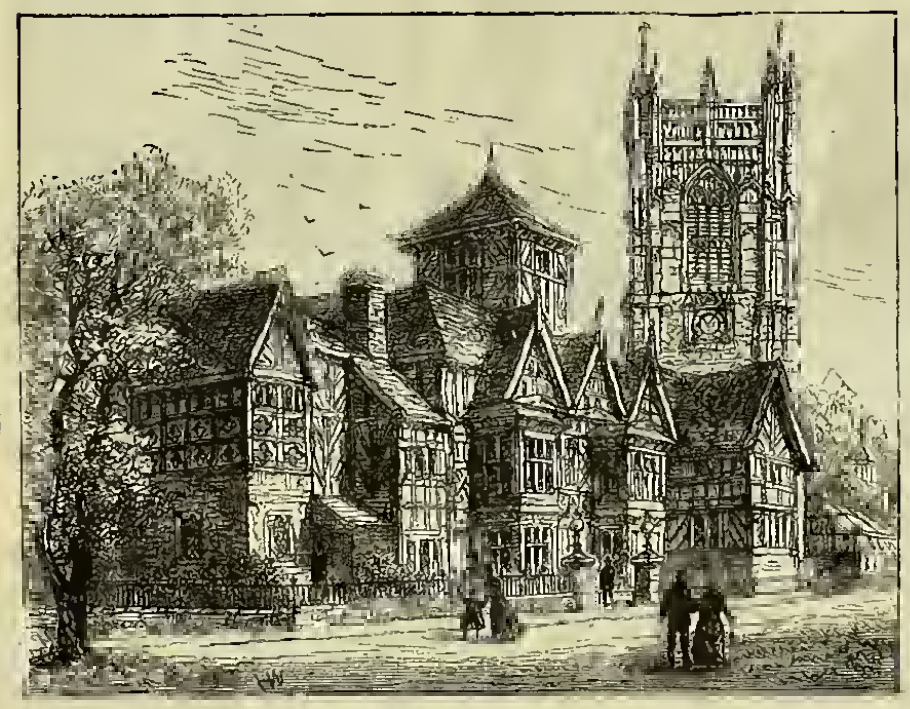
Sec. 9. Every drain shall be trapped with a running trap of the same size and material as the drain, and, if within a building, such trap shall be provided with a hand hole for convenience in cleaning. No connection shall be made with the drain on the street side of said trap. There shall be a fresh air inlet pipe entering the drain on the house side of and close to said trap, of a diameter of not less than three inches, leading to the outer air, and opening at any convenient place away from windows.

Sec. 10. The inclination of water closet, kitchen, and all other drains not over six inches in diameter, liable

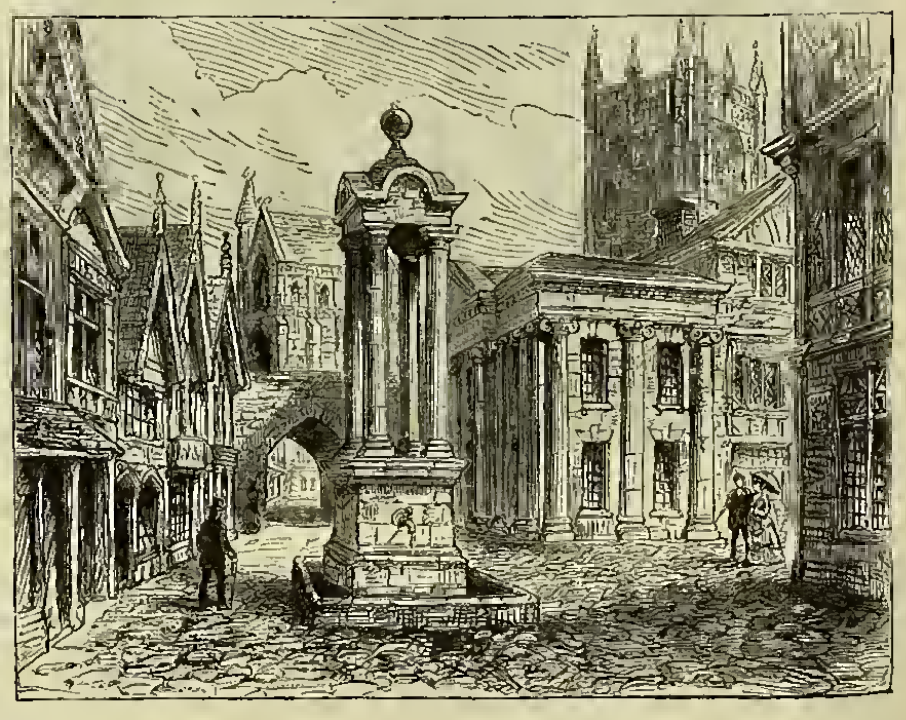


HULME HALL.

ROMAN ARCH.



ANCOATS HALL, AND CHURCH TOWER.



MARKET-STED LANE.

SPECIMENS OF "OLD MANCHESTER AND SALFORD," FROM THE ARCHITECTURAL MODELS AT THE MANCHESTER EXHIBITION.

to receive solid substances, shall be not less than one-half an inch in two feet, and of cellar or other drains to receive water only, one-quarter of an inch in two feet.

SEC. 11. The inside of every drain pipe, after it is laid, shall be left smooth and perfectly clean throughout its entire length, and to insure the same a scraper of suitable material, of the shape of the pipe and slightly less in diameter, shall be drawn through each length of pipe after the same has been laid.

SEC. 12. The ends of all pipes not to be immediately connected with shall be securely stopped by brick and cement, or other water-tight and imperishable materials.

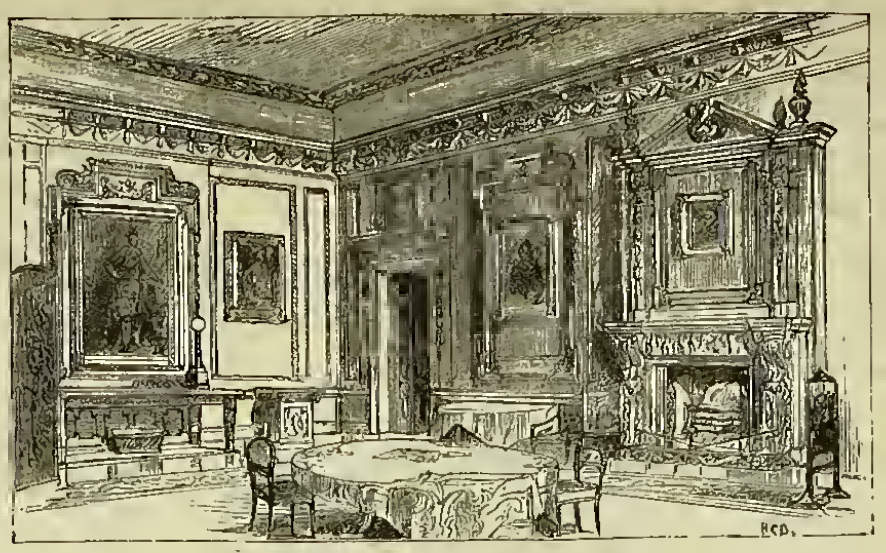
SEC. 13. All pipes that must be left open to drain cellars, areas, yards, or gardens shall be connected with suitable catch basins, the bottoms of which shall not be less than two and one-half feet below the bottom of the outlet pipe, the size, form, and construction of which are to be prescribed by the officer named in Section 3. When meat packing houses, slaughter houses, lard rendering establishments, hotels, or eating houses are connected with the sewers, the dimensions of the catch basins shall be required to be of a size according to the circumstances of the case. When the end of the drain pipe is connected with a temporary wooden catch basin for draining foundations during the erection of buildings, the drain layer shall be held responsible for dirt or sand getting into the drain or sewer from such temporary catch basin.

SEC. 14. All exhausts from steam engines, and all blow offs from steam boilers, shall be first connected with a catch basin of such dimensions as the officer mentioned in Section 3 may prescribe, and in no case shall they be allowed to connect directly with the private or public sewers, without special permission from the board of public works.

SEC. 15. Sewer, soil pipe, or waste pipe ventilators within a building shall not be constructed of brick, sheet metal, or earthern ware.

SEC. 16. Rain water leaders connecting with drain or soil pipes, and opening near windows, shall be trapped, and when placed inside of buildings shall be of iron, with joints calked with molten lead.

SEC. 17. Every wash basin, bath tub, sink, urinal, water closet, or other fixture shall be separately trapped as close to the fixture as possible. Water sealing traps of any pattern may be used when separate air pipe connections from the top of the same are provided; where separate air pipe connections are not provided, traps which will not unseal shall be used, such traps to be first approved by the inspector of buildings.

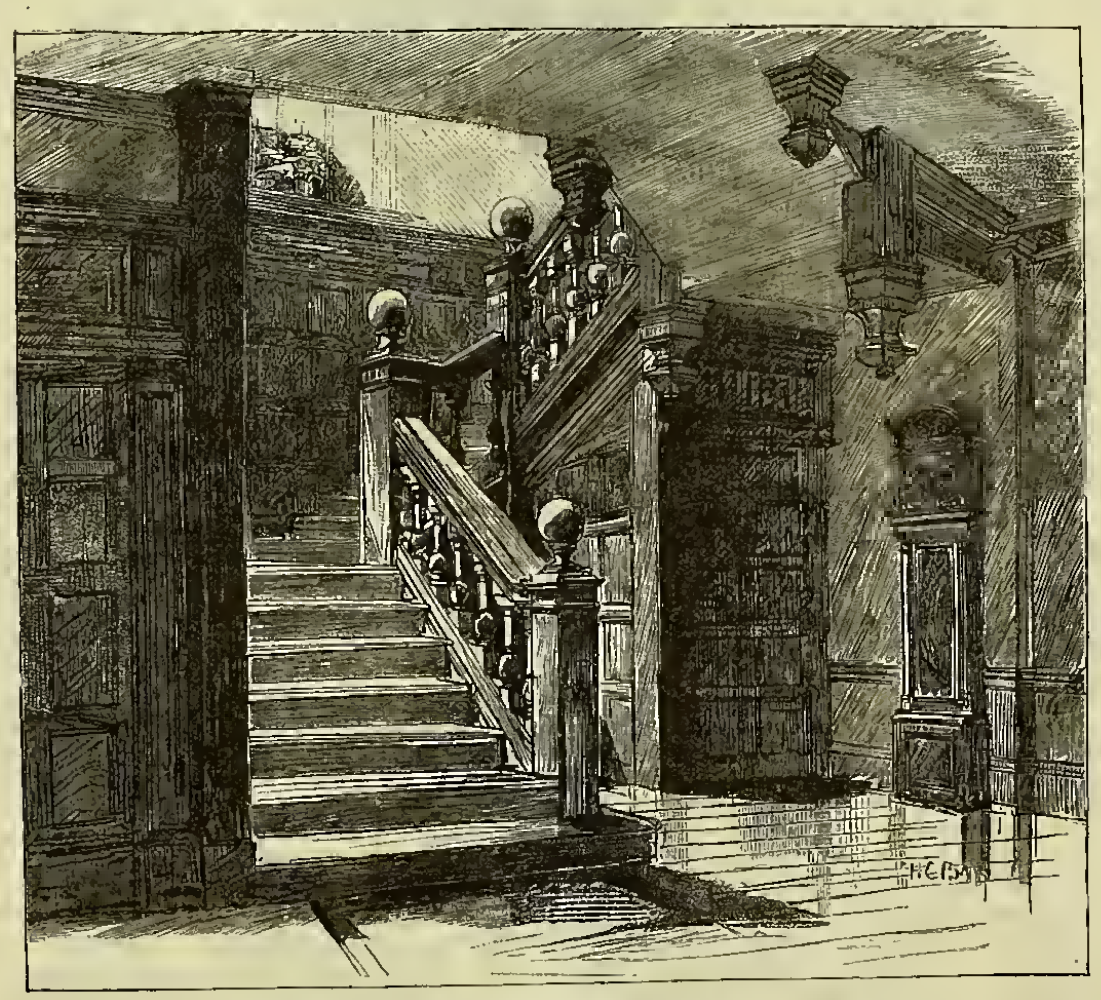


THE DINING ROOM, TATTON.

SEC. 18. When separate air pipe connections are provided for back airing traps, they shall be of a size not less than the waste pipe; but air pipes for water closet traps shall be of not less than two inch bore for thirty feet or less, and of not less than three inch bore for more than thirty feet. Air pipes shall be of not less than two inch bore where they pass through the roof. Two or more air pipes may be connected together, or air pipes may be connected with a soil pipe; but in every case of connection with a soil pipe such connection shall be above the upper fixture of the building.

SEC. 19. Drip or overflow pipes from the safes under water closets and other fixtures, or from tanks or cisterns, shall be run to some place in open sight, and in no case shall any such pipe be connected directly with a drain, waste pipe, or soil pipe.

SEC. 20. No waste pipe from any refrigerator, or other receptacle in which provisions are stored, shall discharge into the soil of any cellar bottom, or into the soil beneath any floor of any building; all connections of such waste pipes, with a drain, soil pipes, or other waste pipes, shall be provided with traps suitably ventilated, and in every case where such connections are made there shall be an open tray between the trap and the refrigerator.



QUEEN ELIZABETH'S STAIRCASE AT TATTON.

SEC. 21. Drains, pipes, and other fixtures shall not be covered or concealed from view until after the work has been examined by the authorized inspector, who shall be notified by the drain layer or plumber when the work is sufficiently advanced for inspection.

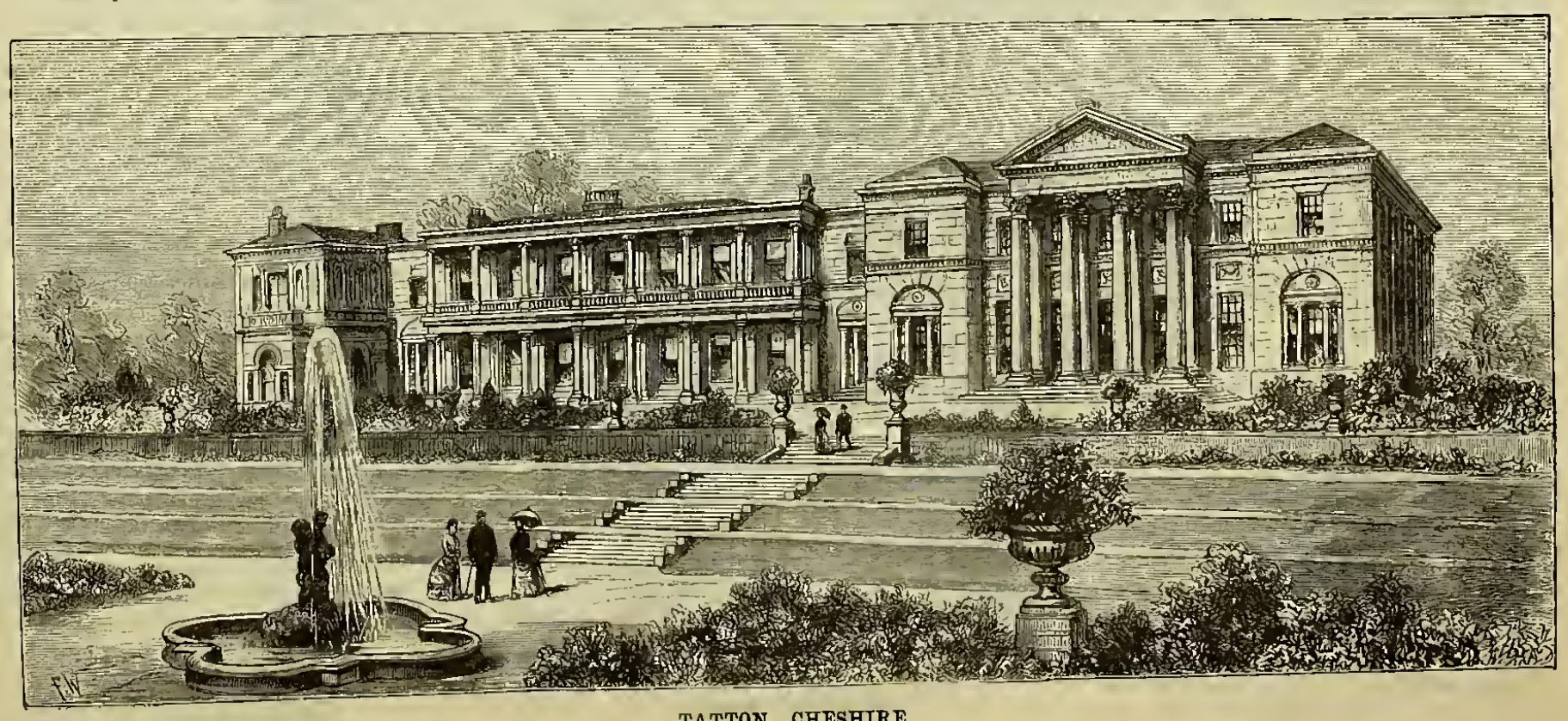
SEC. 22. Plumbing work shall not be used unless the same has first been tested, at the expense of the plumber, by the authorized inspector, with the peppermint, ether, or smoke test, and by him found satisfactory.

SEC. 23. No privy vault or cesspool shall be built upon any premises situated upon any street where there is a public sewer.

SEC. 24. Every cesspool shall be built of stone or brick, and provided with an iron cover which can be readily removed, so that the contents may be inspected.

SEC. 25. No privy vault shall be connected with a public sewer. Vaults of privies shall be built of brick or stone laid in cement, and shall be cemented so as to be water-tight, and shall be so constructed that no surface water can find access to them. Every such vault shall have convenient approaches for opening and cleaning, and such approaches shall be properly covered. No privy vault shall be built within ten feet of a dwelling house.

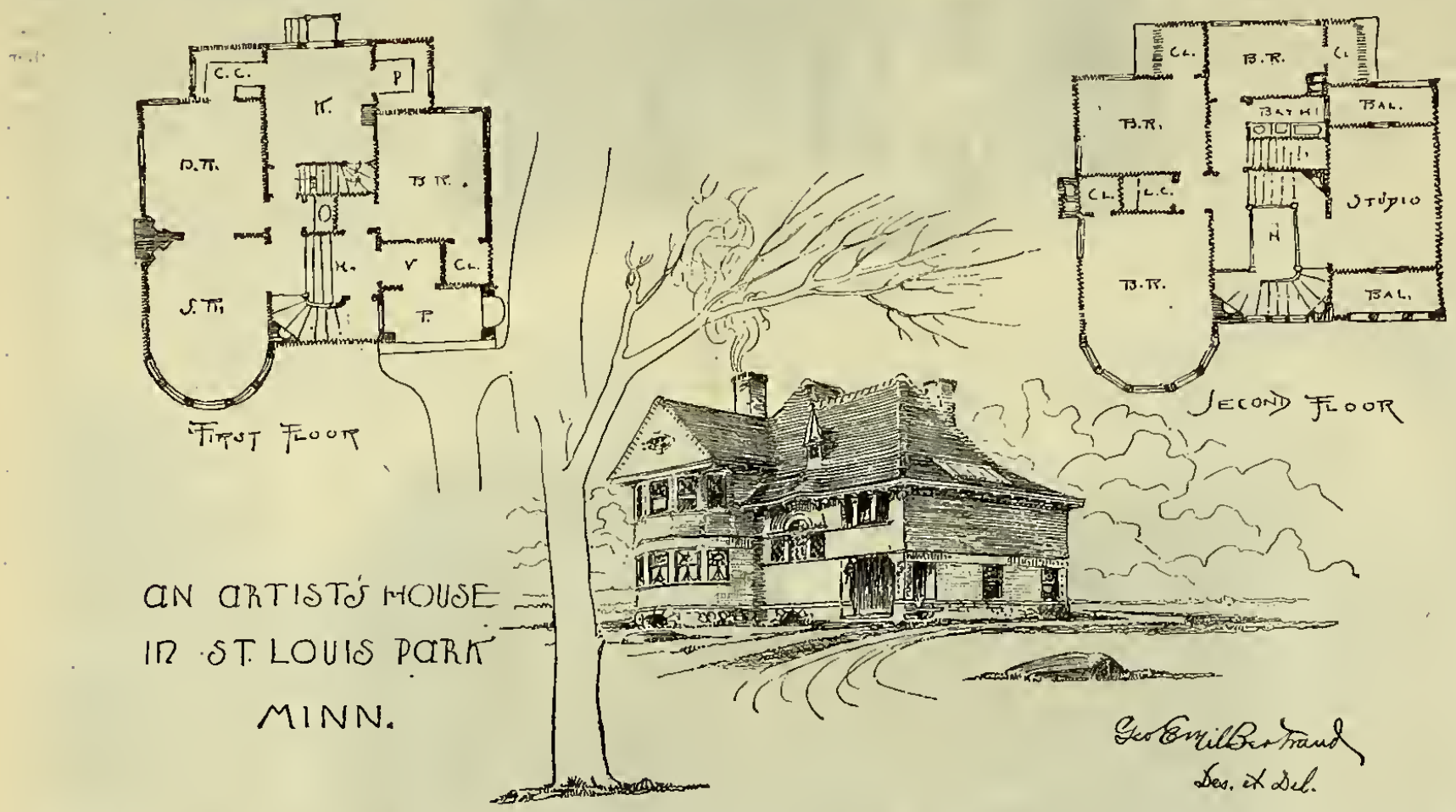
SEC. 26. The authorized inspector shall promptly



TATTON, CHESHIRE.

condemn and order the removal of any defective materials, or any work done other than in accordance with the provisions contained in the foregoing sections, and the contractor putting in such defective materials or shall have done such work, or the owner of the building, shall, upon receipt of such order, remove such defective materials and any work so ordered.

Sec. 27. Every person who violates any of the regulations contained in this ordinance shall be fined not more than $50.



AN ARTIST'S HOUSE.

Our sketch, which is in the nature of a suggestion, shows an artist's house in St. Louis Park, Minneapolis, Geo. E. Bertrand, architect, of that city. Such a house may built for about $5,500. We are indebted for our sketch to the *N. W. Architect.*

VARYING MITERS.

In the ordinary routine of work pertaining to each of the different woodworking crafts, there are certain forms of joints, cuts, or important details of construction and decoration which are well known and occur almost daily, and other forms of the same which are varying. As those which are most in use are more easily worked and familiar to the operator, so it must of necessity follow that unusual forms will call forth more labor of brain and manual skill to effect their successful completion. This is particularly applicable in the case of the miter joint, which every woodworker is in daily contact with. It is being continually employed in different parts of joinery, in all places where a continuous grain or moulding is required, but the most difficult of all its employments to execute is the mitering of mouldings, both flush and raised, in framing. Here the intersection of the profile, especially those with many members, necessitates great care in marking the miter box and sawing it, marking and sawing the moulding, and insuring its perfect intersection before driving the pieces to their permanent place in the panel. Concerning a simple square miter of the angle of 45°, as it is too well known to require special comment here, we will avoid its consideration, except to recommend readers to take careful heed of three important points, essential to perfect mitering:

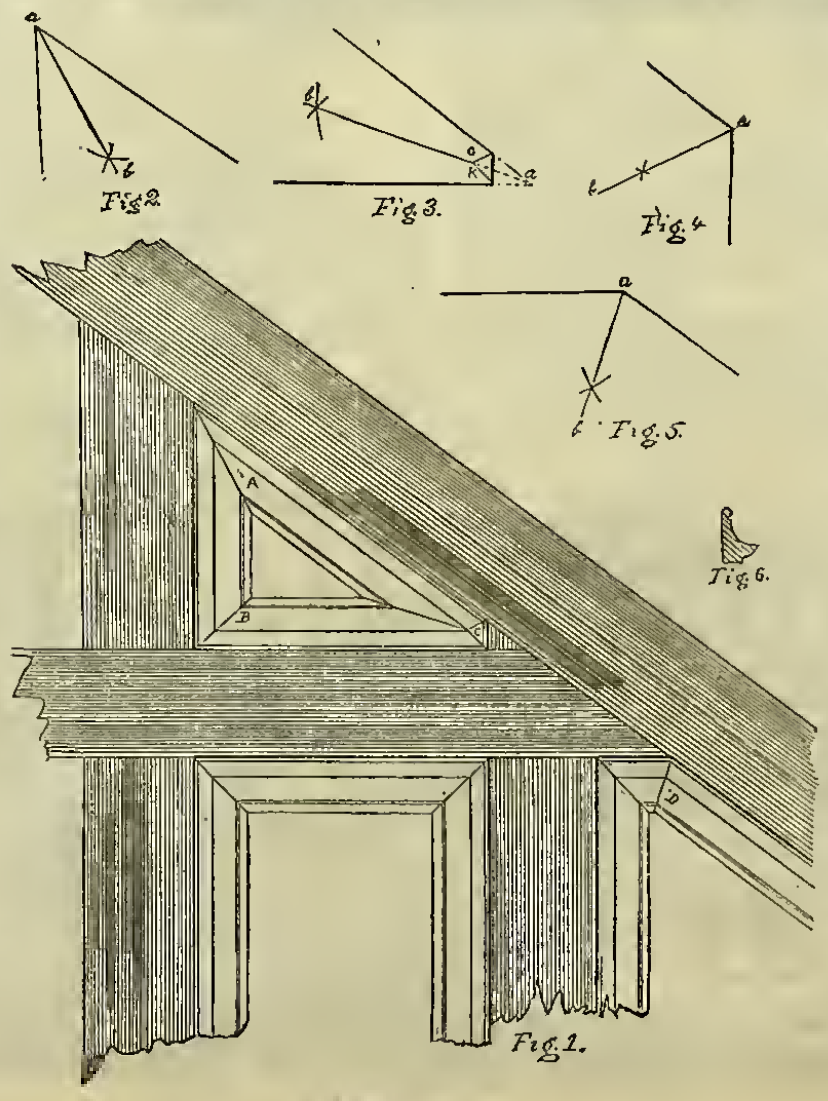
First:—To mark the miter box by a bevel set to the diagonal of a square about 4 in. wide, laid down with a knife on a clean board

Second.—To mark the box also with the knife and saw, carefully, keeping the saw kerf to one side of the knife mark.

Third.—Saw moulding exactly to the mark made on the panel, and out of one continuous piece for each panel, round the sides, and intersect perfectly before driving down.

Care and exactness will help to perfection and save trimming off afterward.

Fig. 1 represents a piece of ash paneling, designed to stand under a stair string. It embraces four miters of different angles, one of which involves in itself three separate intersections. By referring to Fig. 1, it will be seen that the angle A is less than the angle of 45° at B, and being thus acute or less, the moulding will form a longer intersection or miter than B. Similarly, the angle at D is greater than B, consequently the miter is shorter, which is plainly seen in the sketch.



VARYING MITERS.

To find the miter at A, strike out the angle inside the framing at A, like Fig. 2. Take any two points equidistant from *a*, Fig. 2, the apex of the angle. With the compasses, strike the crossed lines shown and draw a line joining their crossing with the apex of the angle. This line will be the exact miter, and if a bevel be set to it and marked on a good box, the cut can be got direct from the saw.

Fig. 3 shows the compound miter at C. It is rendered compound by the insertion of a small piece necessary to continue up the mullion below the rail shown, and the miters are found thus. The angle at the corner of the rail and raked piece, being even less than at *a b*, will be longer, and this line is gained by the method used above. B being a right angle, the miter for it is cut in an ordinary 45° box, but *o* must be cut to the line *a b*, shown at Fig. 4, which is the miter for the upper corner at C. These two cuts will give the small piece, its length being obtained on the small piece of mullion.

It will be noticed that the point of intersection of the three combined miters is at the apex or junction of the two main curves of the moulding represented at Fig. 6. The great length of the principal miter in this corner rendering it unhandy for a box, it is recommended that the moulding be marked on the bottom side and the miter cut square to the bottom to insure a close joint above. This method will always be found suitable for very long cuts. The fifth miter, shown in Fig. 1 at D, is obtained by the same process as before, and, being short, can be marked on (Fig. 5) and cut in the miter box.

Finally, experience has taught that the only way to obtain a perfect miter is from the saw alone, as it is invariably the case, no matter how carefully the block plane is used, the joint can never be evenly surfaced or satisfaction gained.—*By Owen B. Maginnis, in the Journal of Progress, Philadelphia.*

Wire Fences.

When barbed wire first came forward as a competitor with four and six inch strips as a material out of which to construct fences, it was feared that the demand for this particular kind and grade of lumber would so far decline as to leave it somewhat of a drug in the market. This was some years ago, and since that time perhaps even more than was apprehended respecting the increasing use of wire has come to be true. It is impossible to even estimate the miles upon miles of this almost invisible but efficacious material that has been bought and used in fencing Western lands. It has met with disfavor in many quarters, but despite all that has steadily made its way, the supreme recommendation of cheapness proving invincible. It is the old story of the cheaper driving out the dearer material, that is bound to be told of every case in which they come in conflict.—*Timberman.*

A Blacksmith's Epitaph.

Carisbrooke Church, said to be founded 1064, has been partially restored, says the *British Architect.* It is beautifully situated, surrounded by a fine old churchyard, adjoining the "Priory Farm House," the site of the priory attached to the old church. There are a few monuments and a pulpit, dated 1658. The tower contains eight bells. There is some fine, bold carving on the pinnacles, and the view from the tower is magnificent. There are some curious stones in the churchyard. A slab over the grave of a farrier has the following lines:

"My sledge and hammer lie reclined.
My bellows, too, have lost their wind;
My fire's extinct, my forge decay'd,
My vice all in the dust is laid;
My coal is spent, my iron gone,
My last nail's driven, my work is done."

M. Ruprich-Robert.

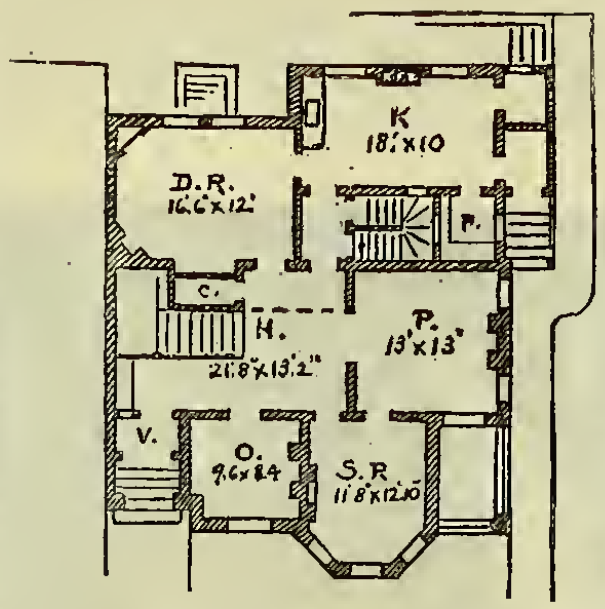
The death is announced of M. Ruprich-Robert, who held a distinguished place in the ranks of French architects. In *La Construction Moderne*, M. Maurice du Seigneur gives the following account of his life and works:

French art has sustained a great and veritable loss, for he who has just died was not only a master in the full sense of the word, but also one of those rare spirits who seem to be the guardians of the primitive forms of our national architecture, a scholar who was conscientious and precise, fascinated with the study of the past and careful of the independence of artists in the future. Ruprich-Robert belonged to that valiant school who defended mediævalism against the stupid attacks of routine and conventionalism. Like Viollet-le-Duc, he was one of the most vigilant and sagacious of the restorers of the monuments which were termed Gothic by the successors of the famous Petit-Raidel, the imaginative architect, who proposed to transform the pillars of churches of the fourteenth and fifteenth centuries into Doric columns resembling those of Pæstum. It must be said, however, that if Ruprich-Robert preferred mediæval art, it would be unjust to fail in recognizing his respect for the works of antiquity and for the works of a later time which were inspired by them. With so vast and honest an intelligence, he was perfectly able to comprehend the gracious adaptations of the Renaissance, as seen in the pomp of the seventeenth century and the caprice of the eighteenth. His protests and disdain were reserved for the immaturity and want of equilibrium of the present. His apprehensions, which were expressed with energy, were excited by the menacing apparition of that official art which is sure to lead to the banalities of academicism of the official sort.

In appearance Ruprich-Robert resembled one of those respectable and austere figures of apostles that are seen under canopies in the doorways of churches; and as they seem to smile at the young birds who build amid the sculpture of the tympanum, so he regarded with affection the students who were to be the architects of the future. His opposition on the subject of official diplomas must not be misunderstood. He was the first to recognize how much had to be gone through before gaining one of them, and also the talent and capacity of the competitors, but he feared that the diploma would lead to the supremacy of mediocrity in art, of which he was always an opponent.

Victor Marie Charles Ruprich-Robert was born in Paris, on Feb. 18, 1820. At sixteen he entered the *atelier* of Constant Dufeux, and, during the five years he remained in the Ecole des Beaux Arts, was recognized as studious and capable. He became attached to the Commission of Historic Monuments in 1844, and exhibited for the first time in the Salon, the subject of his drawings being the Templars' Church at St. Gaudens, which dates from the twelfth century. They were for the commission, and were followed by others which were also intended to be deposited among the archives. In the Salon of 1847 he exhibited drawings of St. Nicholas, Caen; in 1849, the church of St. Luke, Calvados, and the doorway of the church of Seez. He sent also a design for a sepulchral monument. A second class medal was awarded to him at the International Exhibition of 1855 for the drawings already mentioned, which were re exhibited with others of St. Sauveur, Dinan, and a project for the restoration of the Abbaye aux Dames, Caen. Afterward he was appointed professor in the special school of design and mathematics in the Rue de l'Ecole de Medicine. There he delivered a remarkable course on the history and composition of ornament, in which he developed the principles of his well known book, "La Flore Ornamentale."

In 1878 he was appointed inspector general of historic monuments. The work which has made his name most prominent is the "Flore Ornamentale," a folio volume with 152 plates. He also wrote about the influence of public opinion on the conservation of ancient monuments, and about the "Arenes de Lutece." The most important of his books is known as "L'Architecture Normande aux XIe et XIIe Siecles en Normandie et en Angleterre." It is the result of thirty years of study and observation, and exhibits in a new light the success of the art on both sides of the Channel. It contains 170 engraved plates, historic and descriptive letterpress, illustrated by about 200 designs. The last months of the life

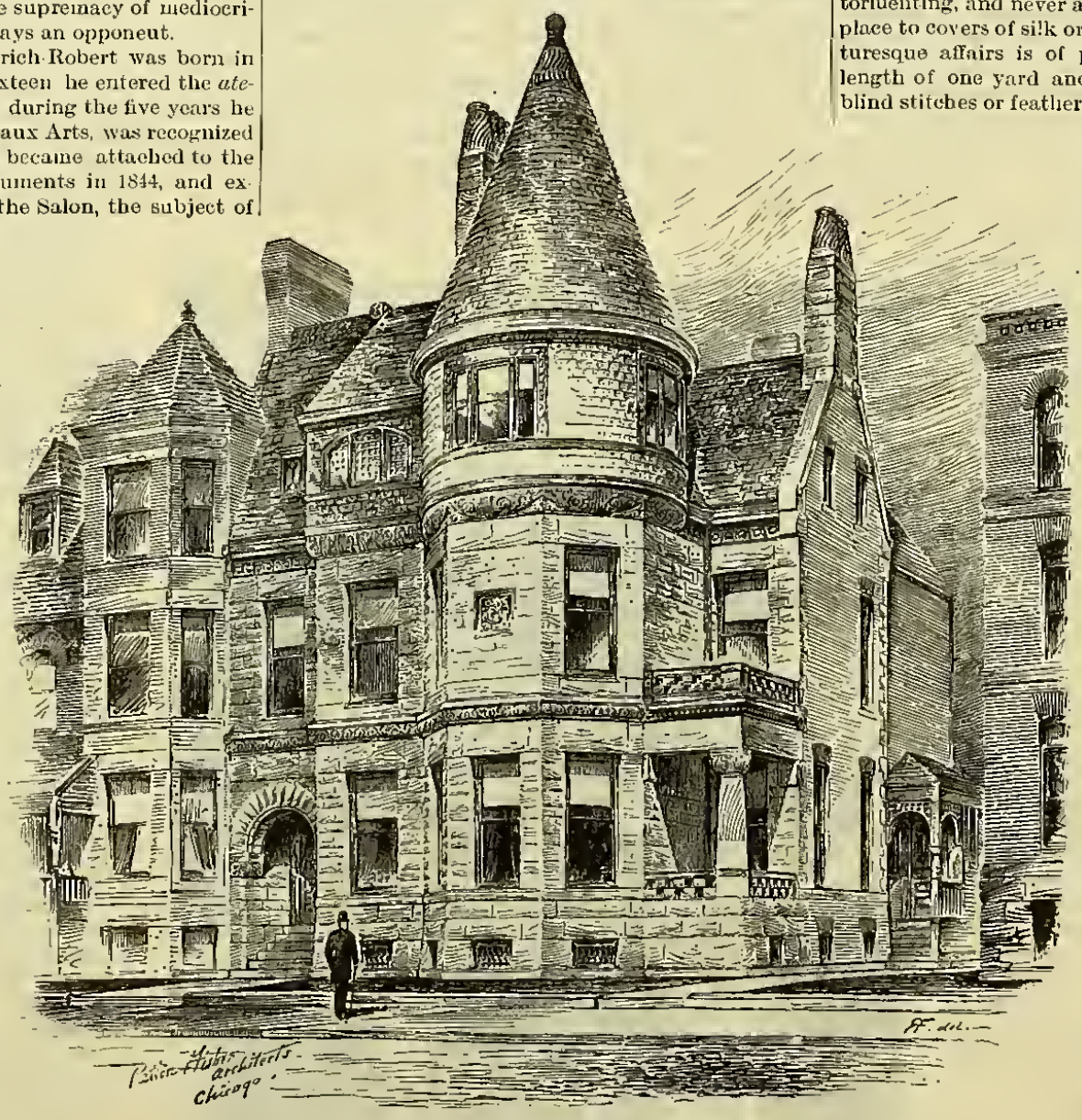


of M. Ruprich-Robert were employed on the completion of this work, which is a veritable historic monument.

It was in Cannes on May 7, at half-past six in the morning, that he expired. He left three sons, one of whom, M. Gabriel Ruprich-Robert, was the faithful and intelligent auxiliary of his father, and who will, no doubt, as an architect uphold the credit of his name. His father's work and life may be summed up in two words—"Science and Conscience."

A CITY RESIDENCE, CHICAGO.

We give, from the *Building Budget*, the sketch of a city residence for Mr. A. B. Lawton, Superior Street, near St. Clair, Chicago. A substantial and pleasing structure, which reflects credit on the architects, Messrs. Patton & Fisher. The house is of stone, the cornice and upper part of the tower of copper. The size 38×48 ft., and the cost sixteen thousand dollars.



A CITY RESIDENCE CHICAGO.

PETRIFIED lobster, clams, turtles, and the like are found in great abundance in the Santa Catalina Mountains in Arizona, at a height of nearly 10,000 feet above the level of the sea.

Home Interiors.

In furnishing, one must consider, first, the uses to which articles will be put; second, the amount to be expended; and, above all, the real comfort to be secured from possession of, possibly, "high art furnishing." Do not sacrifice comfort to artistic desires, for true artistic designs are comfortable, and proper outlines are the groundwork; while details of beauty are made subservient to practical uses. High art nonsense is fast passing out of sight as art is developed in so many channels of practical usefulness.

Fancy gilt chairs with spindle legs are put in dark corners, allowed at times to hold one's fan, a stuffed dog, owl, or alligator, but the true art chairs have solid frames, careful filling and covering. They are beautiful from the fact that they are supremely comfortable. Sofa, divan, and floor cushions are large, comfortable, and softly rounded, full of carefully prepared material which produces a perfectly rounded outline and graceful form.

Cheap art furniture has had its day. Ungainly chairs into which one must climb, wretched sofas so full of art features that one almost despaired of life if obliged to use them continually—these have almost disappeared, for poor people have found out that the wretched affairs are only a delusion, and that the time spent in keeping them together would earn a better outfit. Home interiors gain beauty from the grouping of needful articles, the pleasant articles which make the inmates feel that home is the best place in the world, and that here there is room for every fancy. The book lover has a table that will hold his student lamp and all his needful books, the artist member has a corner with good light for the easel, while the piano has its own cozy chair and adjustable music rack. Baby has her own little rattan rocker, bright with bows of ribbon, and grandmamma looks picturesque in a huge rattan rocker, whose soft cushions are of plush or cretonne, to suit the season.

It is the touch of beauty upon needful articles, not the introduction of art features, which really makes the interior furnishing artistic and lasting in beauty. What shall we offer in place of tidies? some one asks. A proper tidy was made of lace and ribbon. This dainty creation followed the generous covers our great-grandmothers used to protect furniture. To-day we have returned to furniture covers, and the tidy, useless, tormenting, and never appropriate to its use, has given place to covers of silk or linen. One of the most picturesque affairs is of pongee or wash silk. Take a length of one yard and a half, finish the edges with blind stitches or feather stitching, and finish the ends with tiny tassels of silk, which come already to put on. Knot the silk into a loose sailor knot or bow of any kind, and put it on the chair with fancy tidy pins. A square backed lounging chair can have a square cover of linen or silk, cut to fit over the chair back, falling short at the back, long in front; sew the sides strongly and draw over the chair back, covering top only. Embroidery in wash silk will make this addition fanciful as one could wish, and your pretty trifle cannot get away, will wash, and still be beautiful.—*American Art.*

Pa Crusta.

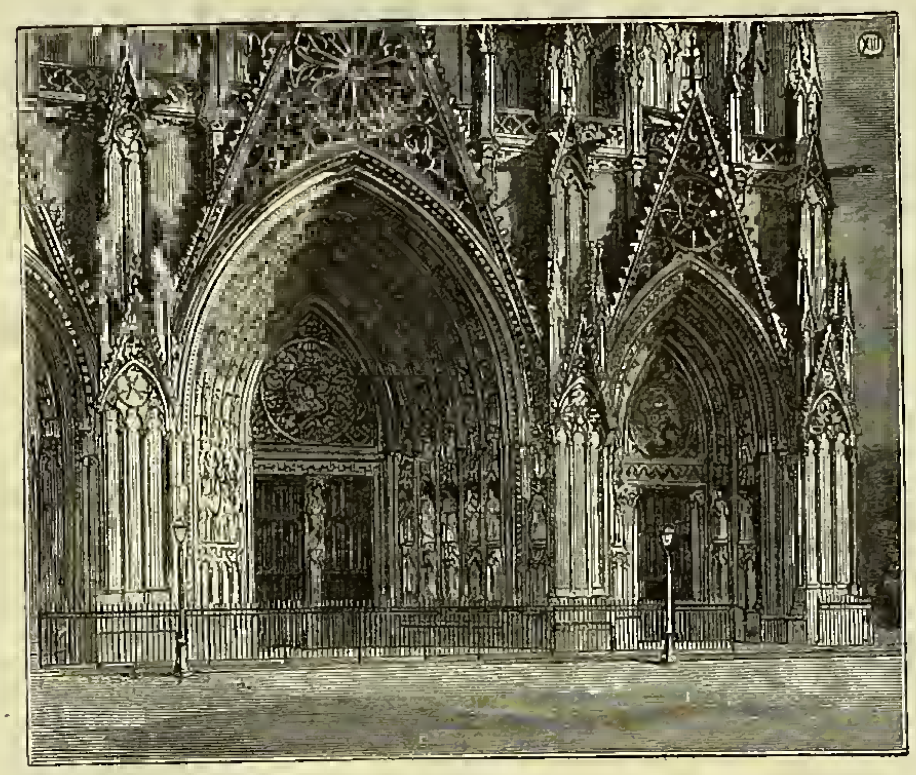
A new style of interior decoration has just been introduced in Minneapolis, the first work of the kind having been put up on the walls of Mr. Legg's jewelry rooms, which opened May 1. The new invention is known as Pa Crusta. It is simply different grades of paper soaked in glue water and formed into various shapes by the hand of the workman as he places it on the wall, where it hardens and is then decorated by the painter. While it is cheaper than linerusta or stucco, it is far handsomer, and no two walls are ever decorated alike. In the hands of competent men, there seems no limit to the variety and styles and practically none to the beautiful effects to be obtained. It is equally adapted to the elaborate decoration in public places and to the simplest forms of ornamentation required in the houses of those who are able to bear the cost of stucco and the like.—*N. W. Architect.*

GEMS FROM ROUEN.

We give a few illustrations of memorable buildings in Rouen, France, for which we are indebted to *Le Monde Illustre*. First is the ancient pile known as the Hotel Bourgtheroulde. Next a front of the famous cathedral of Notre Dame. This wonderful structure dates from the thirteenth and sixteenth centuries. It is 434 ft. long and 103 ft. broad, with transepts 174 ft. long. The nave is 89 ft. high. The ornamentation of the front is superb. Its three grand portals are flanked by lofty towers. The central tower, which stands at the intersection of the nave and transept, is surmounted by an iron spire 470 ft. high. The interior decorations are elaborate and profuse. There are 130 windows. The church contains many tombs of celebrated worthies, among them that of Richard Cœur de Leon.

Another of our illustrations is that of the portal of the abbey church of St. Ouen, a magnificent structure. This church is regarded as one of the most perfect examples of Gothic architecture in the world. It has a tower 260 ft. high, composed of open arches and tracery, and terminating in a crown of *fleurs de lis*.

The city of Rouen has a splendid library of 120,000 volumes, an academy of science, a museum of oil paintings, etc. The place formerly belonged to the English. It was here the Maid of Orleans was burned, A. D. 1431.



PORTAL OF ST. OUEN ABBEY, ROUEN.

Dry Rot.

Having of late years had experience with the destructive and seemingly increasing, though not yet satisfactorily explained, fungi class known in the building trade as dry rot, I think that a few words anent the subject will not be amiss.

My first practical acquaintance with dry rot and its deteriorating work was at a village church of moderate antiquity. It had a few years previously been thoroughly restored, and there were a few small air ventilating grates round the building just above the ground. The part that engaged my special attention was curtained off for the use of the choir, as a vestry, close by the organ, and I was told that the floor which was laid at the restoration had been completely taken up twelve months previous to my visit, entirely rotted by the perniciousness and insatiableness of dry rot, and was relaid with pitch pine, those in power seeming to think that pitch pine was a universal panacea against dry or any other rot. As I saw it (after taking up the linoleum with which the floor was covered), the fungus had eaten through 1¼ in. pitch pine boards in twelve months, and still appeared flourishing in all its luxuriance. The worst places were cut out and replaced with new boards, the linoleum replaced as before, and the reckoning day staved off for a time. Circumstances took me away from the place, and I have not had the opportunity of inquiring after the progress of events since. This I may say, that the church is situated on a high hill, and its surroundings are such one would think unfavorable to dry rot.

My next acquaintance with dry rot was in a building the very reverse of the above—a flour mill in a large town in a valley, with the canal on one side of the building, and a goit or sluice passing under the mill to turn the water wheel. The floor of the basement was, and is, of wood, and below the level of the canal, so that dampness pervades the atmosphere, and ventilation is difficult and expensive—in fact, there was no ventilation to the basement floor, the infected part.

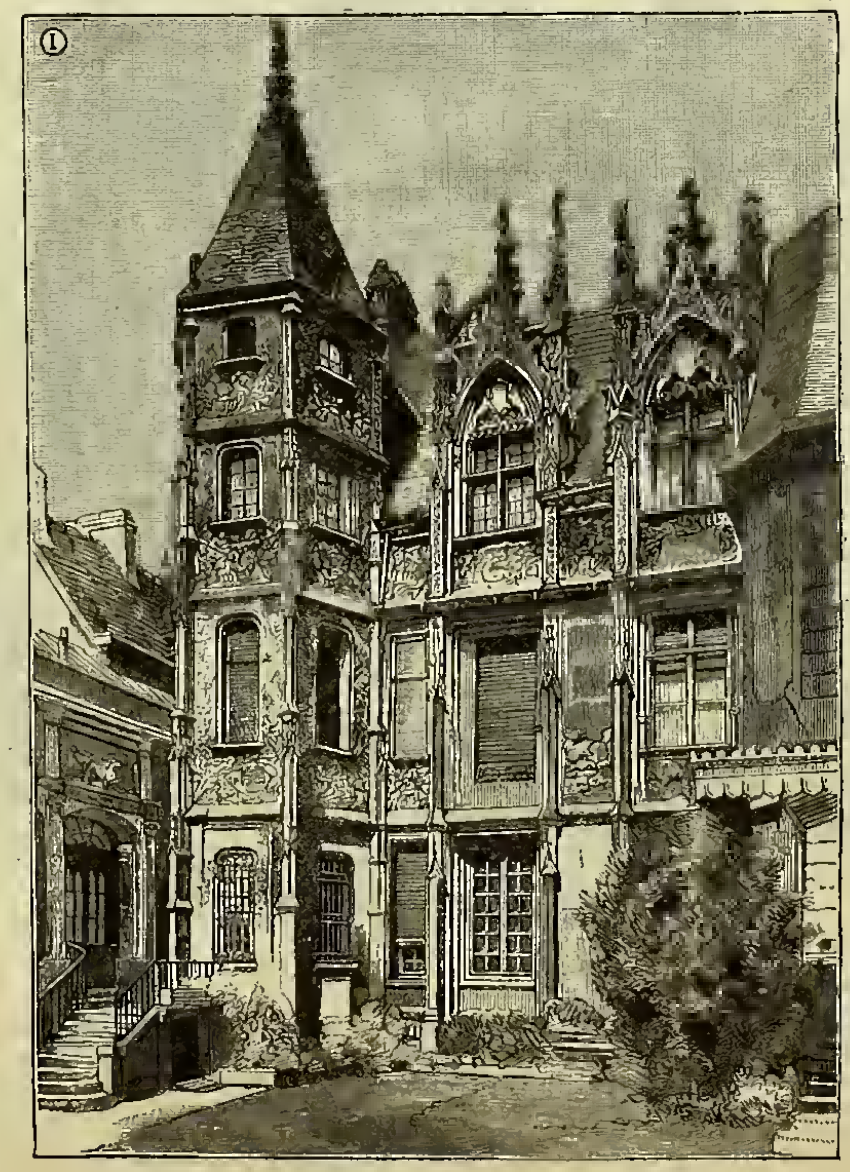
Probably the mistake is in having a wood floor at all, and the most effective remedy, I think, would be to take the whole basement floor up and relay with concrete. As it is, the floor has to have periodical attacks made upon it by the joiner, first in one place and then another. I had the privilege or misfortune to make one of these attacks, taking up a considerable portion and relaying with new timber, having the joists and the under side of the floor boards coated with a good coat of tar. Two years afterward I took up the adjoining part, and so had the opportunity of examining the tarred part, and with satisfaction noted that the dry rot did not seem as yet to have touched it. My next experience was at the post office, built twelve or fourteen years ago. The building itself was designed and built under an architect of professional status and good practice. Here again it was the basement floor. The building itself has a well drained, flagged area all round, the flagged bottom being below the basement floor, and the upper part covered with cast iron grates flush with causeway. Iron ventilating grates led from this area to underneath the floor, the floor being carried on joists on sleeper walls. Here I found dry rot flourishing, and, after taking part of the floor up, found water to the depth of 3 in. or 4 in. Upon tracing this, I found it was fed by a small cistern fixed to supply the kitchen range boiler, the cistern being fed by a ball tap which was out of gear, and had probably been so since the completion of the building. The leakage was of course stopped, the water pumped out, some of the soil taken out to give greater air space underneath the joists, and the worst parts of the floor taken up (which, by the bye, was just where the water had stood; the ground rose slightly from here, and where there was no water the wood did not seem infected) and replaced by new wood, the wood, sleeper walls, and soil being well soaked and washed with copperas or blue vitriol (cupric sulphate) dissolved in boiling water. This was little more than twelve months ago, so I have not yet had the opportunity of taking notes. The next sphere of action was on the opposite side of the road to the post office, in a large warehouse. Here, again, the evil was in the basement floor, which was below the road proper; but a small back yard sloped from the road to the level of the floor, for the convenience of wagons. This inclined yard butted against the warehouse wall with no area, dry drain, or air space intervening. The worst part of the floor was the part adjoining this yard. Indeed, the opposite side of the floor, which adjoined other rooms, was quite sound, the rot seeming to have commenced at the joist ends which butted against the wall bounded by the yard, and to have traveled along them and the under side of the floor boards six or seven feet. The room had a wood dado fixed round it, the part fixed to the wall in question being completely infected and eaten through in several parts; in fact, the space between the dado and the wall was quite choked up with the fungus, it having apparently traveled up the dado and from there to the window bottoms, linings, and even into the window sill, and from thence into the soil of the yard, exhibiting white, minute roots between the joints of the yard sets. One of the windows had a round, white, bulbous protuberance growing outside, something like a mushroom.

This floor had no ventilation, and after taking out all imperfect parts, some of the soil, and the sleeper walls, the ground, walls, etc., were well washed with a solution of blue vitriol, with which also the new wood was impregnated, the joists being carried on brick piers without wall plates, instead of the old sleeper walls with wall plates. An air drain was made between the yard and the wall, covered with iron grates, grated openings being made from this to underneath the floor.

My attention was next directed to the basement floor of another room in the same building. This had an open area adjoining the external walls, but no ventilation of any kind to the floor. The proceedings in this were somewhat similar to the last.

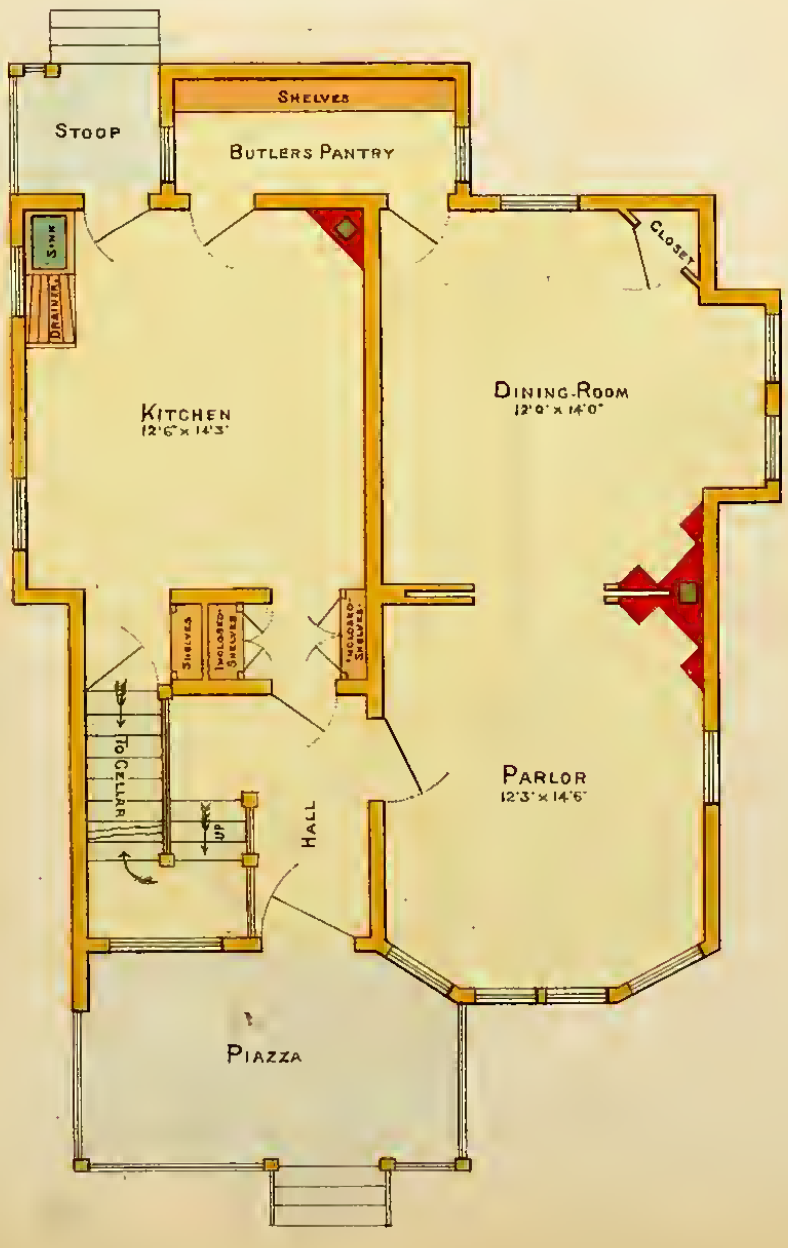
The next attacking point upon this thriving fungus was in the boxing pit of the gymnasium of an athletic club. The attack was not made with the gloves, but by pulling the whole floor up, which was several feet below the road, and had no ventilation. The proceedings here were somewhat similar to the last, except, there being a fireplace, an air draught was led from underneath the floor to feed the fire and to create a draught.

My next acquaintance with the enemy was in a small dwelling house which has only been built two or three years. The house stands by itself on the side of a hill facing a wood, the hill being partially excavated for the building. The kitchen is at the back, and has a cellar underneath. At the front is a small parlor, but no cellarage, the floor of this room resting on sleeper walls, with a moderate depth of space between the floor and the soil, and with a small air grate leading to the front. The sides are parpoint walls (and will be the party walls should houses be erected adjoining), having the soil of the hill butting against them; but on one side there is an open passage leading from front to back, between the hill and the house proper; but the other side had nothing (excepting a fireplace) but the parpoint wall between the soil and the floor, and it was here the mischief commenced—between the fireplace and the kitchen wall. The rot had first attacked the wall plate in this corner, which crumbled away between the finger and thumb; from thence it had traveled to the joists, floor boards, and up the back of the plinth, infecting the whole of the woodwork between the fireplace and the kitchen wall, and from the side wall to about a yard into the room. The other or front side of the fireplace was not touched at all, and here I may

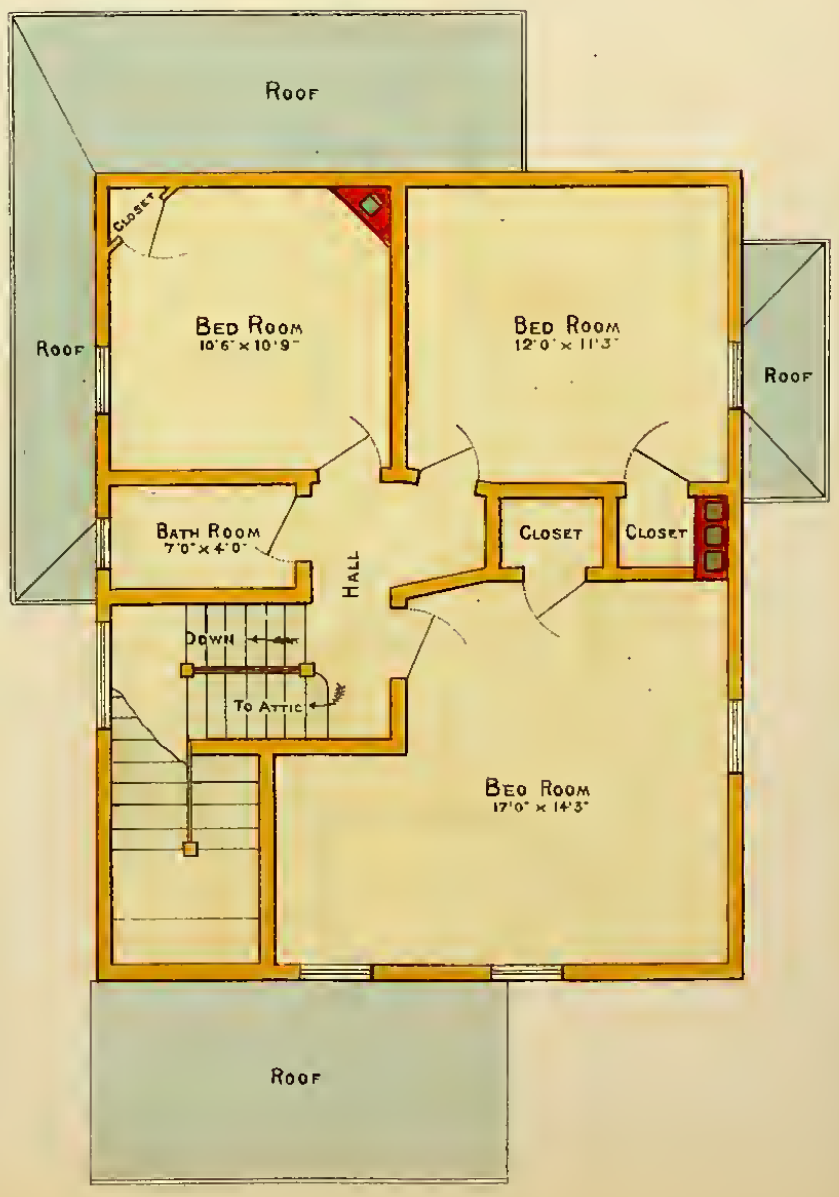


HOTEL BOURGTHEROULDE, ROUEN.

A Cottage for Twenty Five Hundred Dollars.

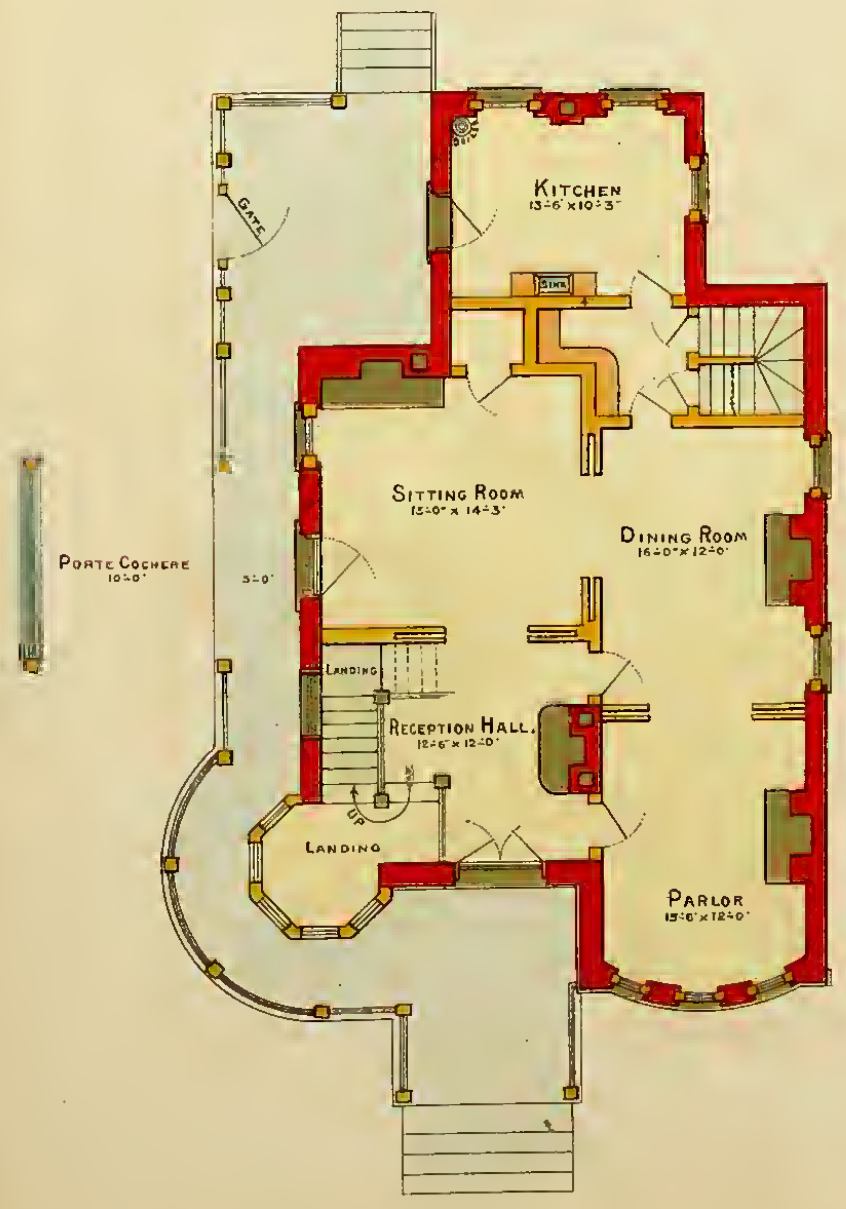


Plan of First Floor.

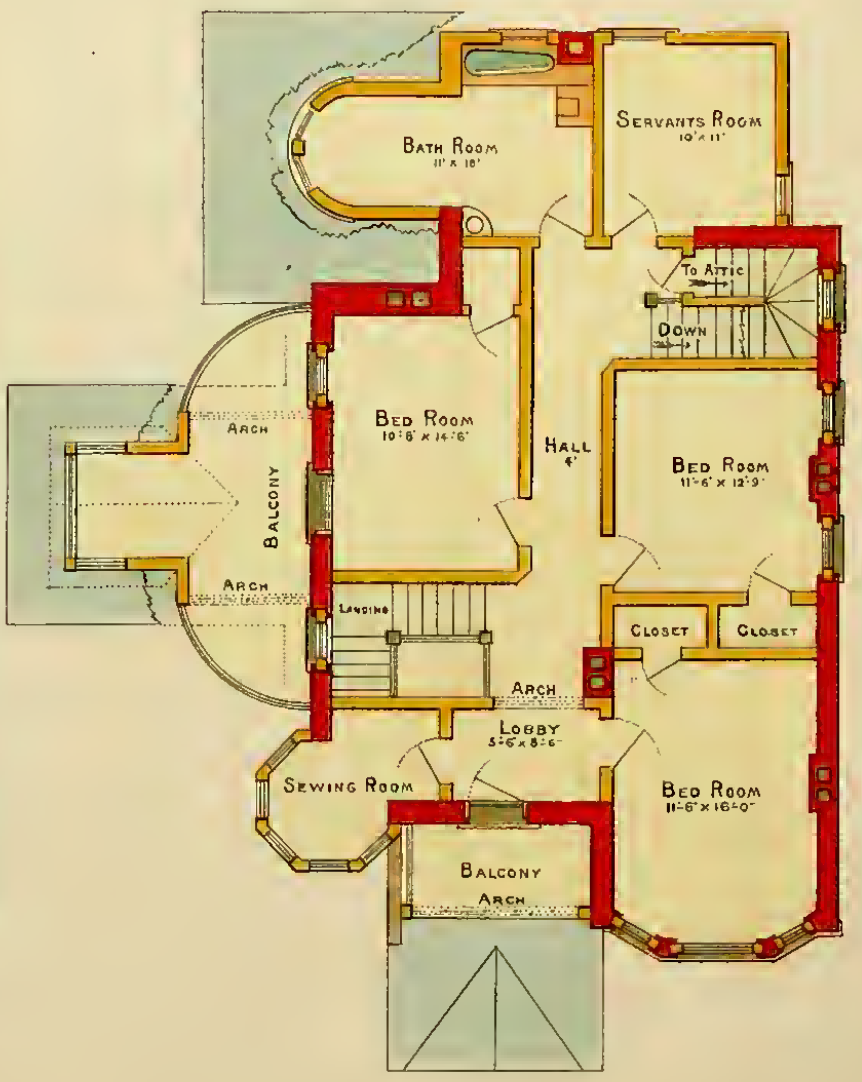


Plan of Second Floor.

A Residence in Kansas City, Mo.



Plan of First Floor.



Plan of Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK.

say that the ground outside sloped to below the joists. The fungus in the infected corner appeared to flourish on the soil under the floor; but it had not traveled beyond the area of the infected part of the floor. The soil was full of small, minute white roots wherever the fungus grew. The infected part was taken out, the ground, walls, and timber carefully washed and soaked with a strong solution of blue vitriol, and an air drain constructed outside.

In conclusion, I may say my observations are these: That the material first infected seems to be Baltic deals, either red or white; that after the *fungus germs* have got established, they do not appear particular what sort or class of timber they attack; that they appear very partial to basement floors and damp, ill-ventilated places; that soil which is of an argillaceous character seems to encourage their growth, and a radius of one mile will include all the above cases.—*J. S. G., in Building News.*

Algerian Marbles.

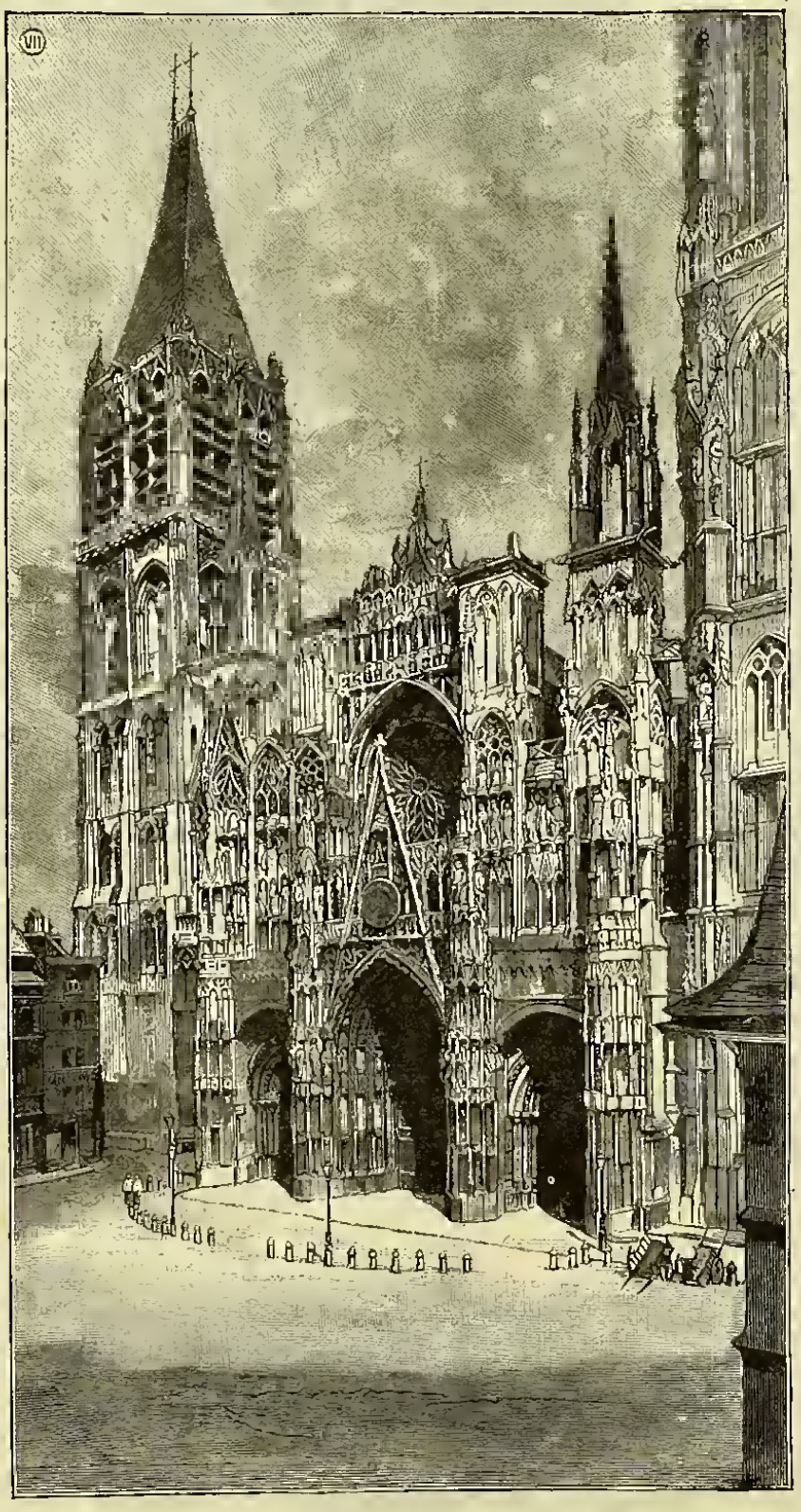
BY ARTHUR LEE.

Very valuable quarries of marble have been found in the French colonies of Algiers and Tunis. It was from these that the Romans procured their so-called Numidian marbles. Numidia proper is outside of the district in which the greater part of the marbles are found; but it gave its name apparently to all of them. Pliny says that Numidia produced nothing remarkable except marble and wild beasts, and that Numidian marble was first brought to Rome under the consulate of M. Lepidus (B. C. 77), who used it in his own house. These marbles were greatly prized by the Romans, who imported great quantities of them; but after the fall of the empire they were altogether lost sight of, and have only lately been rediscovered and worked. The most beautiful varieties are found in a district about 20 miles northeast of Oran, in the western part of Algeria. Near the little village of Kleber rises an imposing mountain called by the colonists "Montagne Grise," from its arid, gray appearance. This mountain is one of a chain which extends in a northeasterly direction from Cape Aiguille on the west to Cape Carbou on the east, and is about the center of the range. On its summit there is a level plateau with a superficies of some 1,500 to 2,000 acres, and running east and west. It is here that the marble is found. At the extreme east a creamy-white marble is produced called "Marmor bianco;" next comes marble of a beautiful flesh colored tint—"Rosa carnagione;" then a fine variety of "Cippolino;" and some yellow marbles of various tints—"Giallo avorio," "Giallo canarino," "Giallo paonazzo," and "Giallo antico." At the extreme west there are a number of breccias—"Breccia sanguina," "Breccia coronata," "Breccia dorata," "Breccia grande"—a deep red marble, somewhat brecciated, and greatly resembling, if not identical with, the famous "Rosso antico"—and a fine black and white marble, "Bianco e nero antico." There are numerous depressions to be seen in the "Montagne Grise," each evidently marking the site of a Roman quarry. Some blocks of stone have been found actually extracted, and some with grooves and wedge holes ready to be raised; but what is somewhat strange, there is no indication of any great monoliths having been prepared, and there is none of the usual debris of a quarry. Colonel Playfair is of opinion that the emperors carefully guarded the secret of these quarries, and that only comparatively small pieces of the precious stone were taken away just as they were separated from the mountain, without even any preliminary hammer dressing. They were probably worked up into mosaics, or used for other finer decorative purposes. Seneca mentions their employment in conjunction with those of Alexandria.

The rediscovery of these beautiful marbles came about by the finding of some very fine mosaics in some excavations made at St. Leu, in the vicinity of Arzen, the ancient Portus Magnus. These were recognized as being very like some of the long lost antique marbles found in Rome, and led to a careful examination of the surrounding country, and the discovery of the treasures on the "Montagne Grise." Some of the first geologists in the country had carefully examined the mountain on account of the iron ore which it contains; they decided that it was not in sufficient quantities to make the working of it profitable; but they had failed to appreciate that it had already performed its task by communicating an almost endless variety of tints to the marble rock.

The beautiful Algerian onyx marble is found at Ain Tekbaleli, near Tlemcen. It is translucent, faintly white and iridescent, and of stalagmite formation, bearing a resemblance to onyx—whence it derives its name. Bands of crystalline white alternate with others of a yellowish brown, dark brown, or umber color. In antient times, these quarries supplied the inhabitants of Rome and Carthage with the marble which was much used for monuments and for the internal decoration of houses. It was often cut into small vases for holding precious ointments, and was one of the stones known as Oriental alabaster. It was not an alabaster as we now understand the word; it is a true marble or carbonate of lime. It was very largely used in the beautiful Moorish architecture of Tlemcen, where Numidian marble is never found. Evidently, with quarries of onyx at their doors, neither the Romans of Pomaria, nor their successors, the Moors of Tlemcen, were tempted to transport any other variety for the decoration of that important city, so many, many miles from the sea. Great quantities of Algerian onyx have of late found their way to Paris, where it has extensive employment. With white or any of the red or pink marbles, it forms a beautiful combination.

The marbles of Tunis consist of three distinct varieties—a yellow marble, the true "Giallo antico;" a fine rose colored marble, and a small brown breccia. The quarries are now being extensively worked by a Belgian company whose headquarters are at Liege. They are situated near Chemtou, on the line of railway between Algeria and Tunis, in the valley of the Medjerda. This locality is not far from the eastern boundary of Numidia. A road was constructed by Hadrian, on his first visit to Africa in 128–129, between it and Tabarca for the purpose of transporting the marble to the sea coast, and thence to Rome.—*Building News.*



CATHEDRAL OF NOTRE DAME ROUEN.

Ancient Relics at Sidon.

Additional dispatches received at the State department from Consul Bissinger at Beirut, Syria, respecting the remarkable archæological discoveries at Sidon, state that the number of sarcophagi excavated is seventeen, found in seven distinct chambers. Beshara Effendi, civil engineer, is having a tunnel excavated for their removal to the seashore, whence they will be shipped to Constantinople. A shaft thirty-five feet square, discovered in the western chamber, led to a sarcophagus twenty-five feet below the surface, with seven large rooms cut out of the solid rock. In a room adjoining the western chamber four sarcophagi were found. One of these, of pure white marble, highly polished and exquisitely sculptured, is ten feet six inches long, six feet nine inches wide, and five feet high, with a cover three feet higher. The roof is composed of tiles resembling leaves, and also shows rampant figures, crouching lions, human heads with double faces, and stags' heads with curved horns. Three of the sides of this sarcophagus are devoted to battle scenes and emblems of war—arrows, spears, bows, and lions, with dead, dying, and wounded soldiers.

The fourth side represents a hunting scene. There are also panels with richly ornamented geometric figures. In one of the battle scenes there are prominent two nude figures of a man and woman. The color is still fresh, as if put on recently. There are scarlet cloaks, blue tunics, and blood oozing from the wounded warriors. In the north room seven Egyptian sarcophagi were found richly carved. In the eastern chamber there were three sarcophagi, one plain and one lavish with exquisitely carved sculpture. This is the famous so-called Greek sarcophagus. It is surrounded by a porch of eighteen fluted Ionic columns and four Doric columns at the corners. Between each of the columns stands a beautiful girl representing "Grief," all cut without a spot or blemish. Two sarcophagi were found in the south room, one of black marble, the other of white. Inside one of these was found a gold ring, a gold chain, and an alabaster vase. The others had been rifled of their contents without suffering any special injury. The local Turkish authorities are jealously guarding these valuable relics.

A Windmill Clock.

A new pattern of a fog bell is to be anchored off Nix's Mate, Boston Harbor. The machinery is constructed on the principle of clockwork. The power for winding it up is furnished by a windmill arrangement 12 feet square, consisting of a number of sails so placed that they revolve at every breeze. A rod is attached to the middle wheel, driven by the pendulum, so that it falls seven times a minute upon a gong, the sound of which can be heard from five to seven miles. The machinery when wound up will run ninety hours without any other winding. The new fog bell is said to possess advantages over all other inventions of the kind in its perfect regularity and in requiring no care.

THE dome of the great telescope of the Lick Observatory, upon Mount Hamilton, is now in position. The framework is covered with a sheathing of copper and nickel. The dome is a hemisphere about seventy feet in diameter. The hope now is that by the middle of September the largest telescope in the world will be ready for use.

NEW HARDY PASSION FLOWER.

(PASSIFLORA CÆRULEA CONSTANCE ELLIOTT.)

An additiou to the list of climbing plants suitable for open air culture in this country is such an uncommon occurrence, says the *Garden*, that peculiar interest attaches to the appearance of a new white flowered variety of such a popular old favorite as the hardy blue passion flower, which, in favorable localities for its growth, is one of the most beautiful wall climbers in cultivation. When this white-flowered variety, Constance Elliott, was first announced, many were induced to think that an albino of Passiflora cærulea belonged to that large family of mythical plants that exist only in the imagination of nurserymen, and certainly the first flowers that were seen of it did not go far to refute the idea, as they were decidedly too green to be termed white. Since, however, the plant has become widely distributed and grown under various conditions, it has quite answered to the description given of it at the outset.

Its flowers, we may here remark, are not snow white, but ivory white, both in the sepals and the fringe, which in the original blue passion flower is of a bluish shade. The Constance Elliott variety, moreover, is a vigorous grower and exceptionally floriferous, much more so, in fact, than its parent, but why such is the case is unexplainable. In every place where the common passion flower succeeds, this new white variety will no doubt supplant it, on account of its being more attractive in flower; and a more delightful garniture for a veranda, alcove, pergola, or wall could not be chosen from the long list of open air climbers. I have seen the Constance Elliott passion flower several times growing and flowering in the greatest luxuriance, but I have never been more struck with its elegance and beauty than when I saw it festooning a veranda, last September, in M. Herbst's garden, at Richmond. It was getting dusk at the time, and the flowers seem to stand out in bold relief from deep green foliage in a charming way, and I at once saw what a valuable open air climber it was.

The variety, I believe, originated in a Devonshire garden, and was distributed by Messrs. Lucombe & Pince, of the Exeter nurseries, and few among the many beautiful plants sent out by that firm surpass this one in value. It has now become tolerably common, for as soon as it was known to be "a good thing" no further recommendation was needed.

The original Passiflora cærulea, represented in the annexed woodcut, is one of our oldest garden plants, having been in cultivation since 1699. It is a native of Brazil and Peru, in the mountainous districts where the climate is mild, about the same climate, in fact, as the southern part of these islands, where the plant is thoroughly at home, and not only flowers profusely, but ripens its fruits. There are few prettier sights in autumn than a wall clad with passion flowers, and hung in profusion with their great egg-shaped fruits of orange yellow amid the luxuriant green foliage. Like all climbers of a similar degree of hardiness, the blue passion flower thrives best against a warm, southerly exposed wall, though on other aspects it flowers well, and may even be grown on open bushes in some favored parts, but under such conditions it rarely fruits well. In very severe winters, such as that we experienced in 1879–80, the passion flower is killed, unless protected; but the plant is so rapid in growth that if a large plant is killed it may be replaced in a season or two if the young plant is treated liberally. There is nothing to say with respect to its culture, as it grows well in any good garden soil, the better if light and rich.

There is no other passion flower that can be grown successfully in the open air in this country, the majority of the species being natives of tropical and sub-tropical regions.

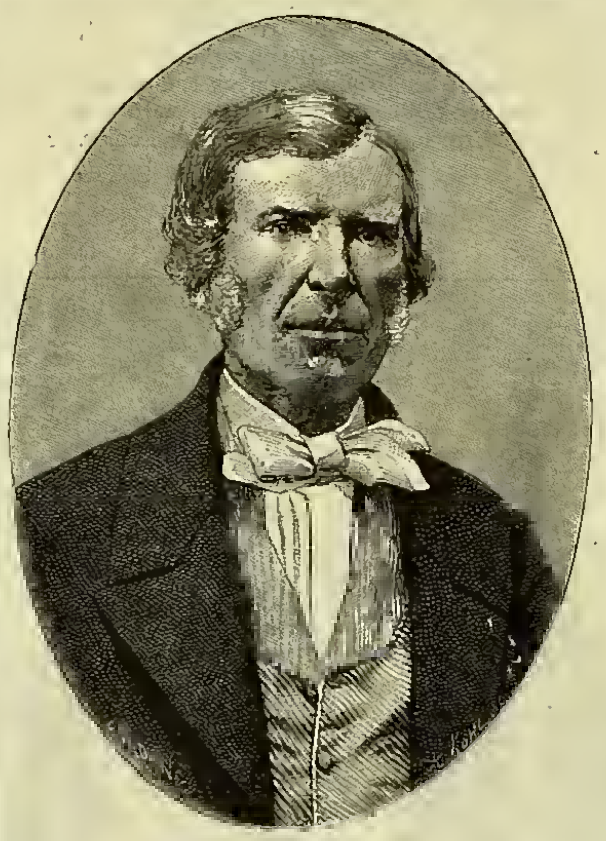
W. G.

Effects of Change of Temperature on Girders.

Some experiments made by Mr. Fairbairn and Mr. Braidwood show that iron loses a considerable proportion of its strength when heated to a temperature of more than 220° Fahrenheit, and that it becomes uncertain below 32°. Mr. Clarke described the effect of the sun coming out and shining on the Conway tubular bridge for half an hour to have been to raise the tube vertically one inch; and he mentions that at night, from the low temperature, the deflection was always greater than in the day time. Mr. Fox instances the effect of frequent and great changes of temperature on some short girders, six feet long, which support the hoods of the forges in his workshops. In the day time they are so warm that the hand can only just bear the heat. At night they become cold. The effect is to make the girders sway, and the swagging appears to be continually increasing. Some have attained as much as three inches deflection in the center, but their strength does not seem to be impaired.

HENRI JACOTOT, RAISER OF GLOIRE DE DIJON.

Until Henri Jacotot delighted the rose growing world with Gloire de Dijon, there was no hardy climbing rose of anything approaching yellow in color. That



HENRI JACOTOT.

a chance seedling should suddenly supply this want in every particular ought by itself to be sufficient inducement to all rose growers to sow the contents of every rose hep that they can lay hands on; for the fact unfortunately remains that the pedigree of Gloire de Dijon was not preserved, and its parentage consequently is not certainly known. The appearance of the plant, however, can hardly fail to give an impression of a strong Bourbon influence, and the late Mr. H. B. Ellwanger, of New York, expressed his opinion that the variety was raised from seed of a tea that had been fertilized by some Bourbon rose. From recent correspondence with Mons. F. Jamin, it appears probable that one of the parents of Gloire de Dijon was the Bourbon Madame Desprez, but no one seems to have any very definite idea as to what the tea-scented parent may have been.

Be its origin what it may, however, Gloire de Dijon remains the delight of rose growers in every part of the world where roses can be grown, and its raiser, the late H. Jacotot, whose portrait is engraved in this month's issue, will be thought of by all grateful rosarians as having been a benefactor of his race. An ingenious writer in a foreign contemporary has lately been endeavoring to show that no rose can be of real value, or a true credit to its raiser, unless both its parents are known; but as long as a variety has qualities that commend it to every lover of roses the raiser's name will be cherished, and certainly the name of Jacotot will not willingly let die. As for the qualities of Jacotot's great rose, it seems absurd to attempt to say anything fresh about a rose that is already classical, and it will be impossible to do better, in concluding this brief reference to the raiser of the most popular rose the world has ever known, than to quote the description of the greatest classic of rose literature, Canon Reynolds Hole, who says of Gloire de Dijon:

"Its flowers are the earliest and latest. It has symmetry, size, endurance, color (five tints are given to it in the rose catalogues—buff, yellow, orange, fawn, salmon, and it has them all), and perfume. It is what cricketers call an 'all-rounder,' good in every point for wall, arcade, pillar, standard, dwarf, *en masse*, or as a single tree. It is easy to cultivate out of doors and in. It forces admirably, and you may have it almost in its summer beauty when Christmas snows are on the ground. With half a dozen pots of it, carefully treated, and half a dozen trees in your garden, you may enjoy it all the year round; and if ever, for some heinous crime, I were miserably sentenced for the rest of my life to possess but a single rose tree, I should desire to be supplied, on leaving the dock, with a strong plant of Gloire de Dijon."

Admiring often the beauty of Gloire de Dijon, both in cottage and other gardens, we thought last year that it would be well to find out something of the raiser and give a portrait of him if possible. We found on inquiry that no portrait had been engraved. We succeeded in getting a photograph, through the kind aid in the first instance of M. F. Jamin, of Bourg-la-Reine, and afterward of Mr. Wehber, of the botanic gardens at Dijon, who kindly communicated with the family of Henri Jacotot. We have the pleasure, therefore, of offering the first portrait engraved of a man who has added a great charm to our gardens. Jacotot lived and was a nurseryman in the town of Dijon, in Burgundy, and died there not many years ago.—Ed.—*The Garden.*

Gloire de Dijon.

Among roses which have stood the test of time, and which still not only maintain their position, but are ever increasing in popularity, few can equal Gloire de Dijon; for although Marechal Niel appeared a few years ago as if it would carry all before it, it must be acknowledged that as an outdoor rose it is as much inferior to Gloire de Dijon as it is superior to the latter under glass. I have grown Gloire de Dijon in all sorts of forms and positions out of doors, and it is always satisfactory; and as a wall climber I do not think that any rose excels it, either as regards beauty when in bloom or the length of time during which it continues to produce its lovely blossoms. It is one of the earliest and latest of roses.

Who has not seen glorious examples of this popular rose on the sunny sides of villa and suburban residences, with its strong shoots of the preceding year's growth, perfect wreaths of delicately colored flowers? We have a plant of it here covering a large space of southwest wall that is seldom seen without blooms or buds on it. Under a continuance of mild weather, this grand old rose well deserves the title of perpetual flowering, and it is no slight boon to have a variety on which one may depend to furnish even a few blooms to cheer the dark days of early winter without the aid of glass. Therefore, to any one about to plant wall climbers, whether on mansion, villa, or cottage, I would say, if you have only room for one, let it be that well tried rose, Gloire de Dijon.—*Hants.*

PASSIFLORA CÆRULEA.

Fire and Water Proof Paper.

The process of manufacture consists in mixing about 25 per cent of asbestos fiber with about from 25 to 35 per cent of powdered sulphate of alumina. This is then moistened with an aqueous solution of chloride of zinc. The mixture is next washed with water, and then treated with a solution composed of 1 part of resin soap and 8 or 10 parts of water mixed with an equal bulk of sulphate of alumina, which should be as pure as possible. The mixture thus obtained should have a slightly pulpy consistency. Finally, there is added to it 35 per cent of powdered asbestos and 5 to 8 per cent of white barytes. This pulp is treated with water in an ordinary paper machine and worked just like paper pulp. In order to manufacture from it a solid cardboard, proof against fire and water, and capable of serving as a roofing material for light structures, sheets of common cardboard, tarred or otherwise prepared, are covered with the pulp. The application is made in a paper machine, the pulp being allowed to flow over the cardboard.

THE HOWE BROILER FARM.

Although there are a dozen large broiler farms at Hammonton, N. J., we have selected the largest and most successful in order to describe it to our readers. The proprietor, Mr. E. C. Howe, is not an incubator manufacturer, nor has he anything to sell. His sole business is that of raising chicks and ducklings for market. He is probably the most successful person at such business in this country, and yet, strange as it may seem, he had never seen an incubator one year ago, and knew nothing at all about poultry. Being given two or three lessons, he ventured ahead, and his most sanguine expectations have been realized.

To describe Mr. Howe's place, it may be stated that the entire space devoted to broilers is 26×200 feet, or about one-eighth of an acre; but one mile from his residence he has 600 hens on a farm, in charge of an assistant, which have also been a success. His broiler farm is on a town lot, in the busy portion of Hammonton, and quite close to the railroad stations. The building (see Fig. 1) is a center house, 20×20 feet, used for incubators, with a slaughter house at the rear, in which the chicks are killed and dressed for market. To each end of the incubator house is attached a brooder house, 10×70 feet, making a total space of 10×140 feet for the two wings. Each brooder house has a passageway two and one-half feet wide extending the length of the building and leading from the incubator house. The brooder houses are divided into partitions 5×7½ feet each (deducting for passageway), making 14 brooders in each wing, or 28 in all, each brooder accommodating 100 chicks, the total capacity being 2,800 chicks every 10 weeks.

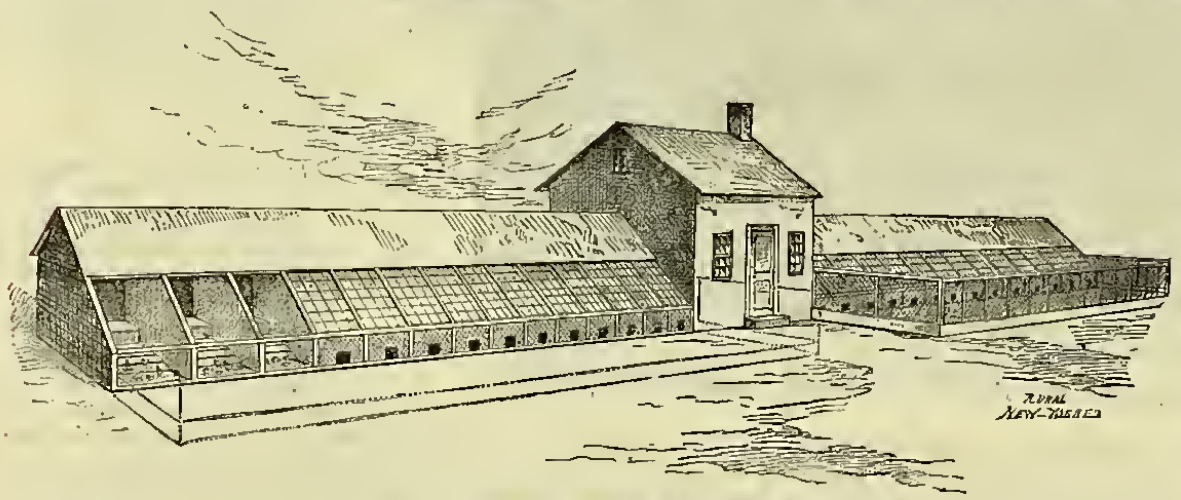


Fig. 1.—HOWE BROILER FARM.

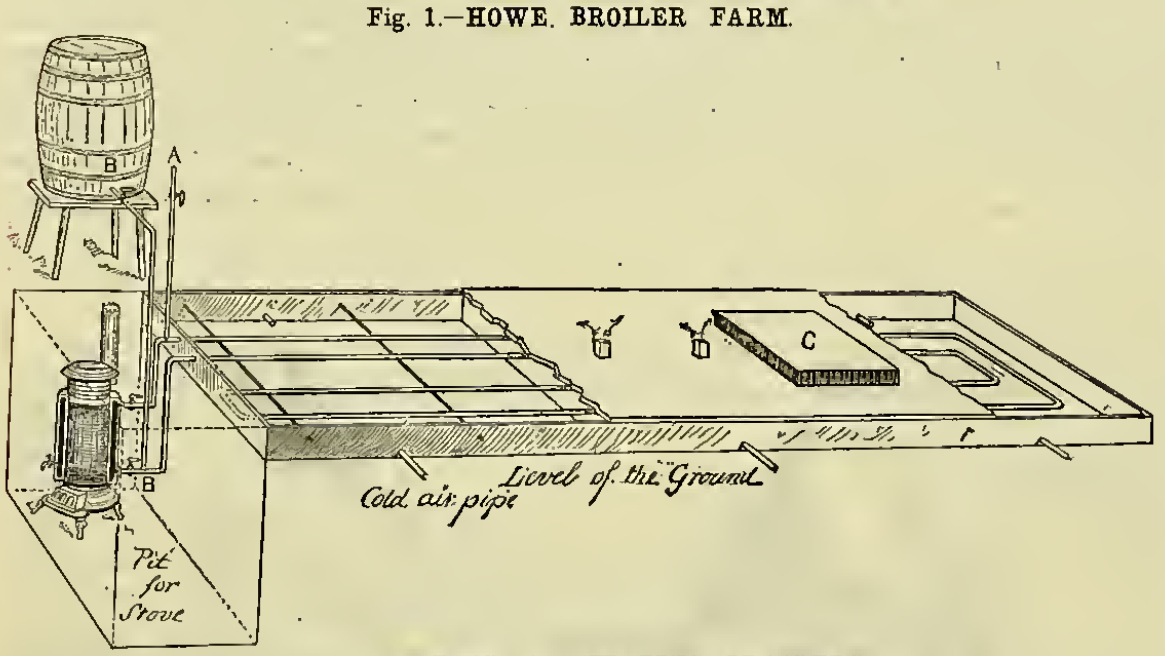


Fig. 2.—METHOD OF HEATING BROODERS.

Mr. Howe hatches and raises his chicks with hot water, and does not require lamps. With a single exception his incubators are home made, no lamps being used, the heat being maintained by drawing off a bucket or two of water from the incubators twice a day and adding boiling water. He has no regulators to them, and yet they require no watching, as he never looks into them during the day or night except to turn the eggs and add the hot water. Limited space will not permit of a full description of the incubator in this issue, but we will state that it is the ordinary hot water tank surrounded by sawdust.

The brooders are heated by hot water pipes (not steam) arranged as shown in Fig. 2. A stove with a circular water back (or boiler surrounding it) heats the water, which rises as it becomes heated, and flows into the pipes, returning to the boiler near the bottom of the stove. Observe the way the pipes are arranged, the first and last being together, thus evenly distributing the heat. A tube, half an inch in diameter (A), is intended to allow the escape of air in the pipes, and is also a safety valve. It is attached to the hottest or highest pipe. B is a keg or barrel filled with water, and connected with the lower pipe, to give pressure to the water. The stove is in a pit, below the ground. The pipes are arranged side by side, in a box one yard wide, six inches deep, and 70 feet long, and are held level and in place by iron rods or supports of any kind. One or two tubes, one inch in diameter, extend from this box, or frame, to the outside—an arrangement which allows pure air to come in and circulate around the pipes; but these cold air pipes must be below the iron pipes, or the cool air will come out of the tubes under the brooders. As the air becomes heated it rises through the brooder tubes, which are fastened in the floor. These tubes are one inch in diameter and 2½ inches high. Over them are "mothers" or brooders, which are 28 inches square and three inches high (for very young chicks), but the legs are adjustable, and the mothers can be raised as the chicks grow. The floor must not be very warm, or leg weakness will result. The heat comes through the tubes and diffuses itself above the chicks. The temperature under the mothers should be 90 degrees.

The chicks are sold when from eight to ten weeks old, and at weights ranging from one to two pounds, according to the market (New York and Philadelphia), and they often sell as high as 60 cents per pound, April being the best month. The loss does not exceed eight per cent after they are hatched, the only difficulty being to procure fertile eggs in winter. When hatched they go directly to the brooders, and are fed nothing for 24 hours. The first 10 days they are fed every two hours (early and late) on bread cooked and crumbled for them, composed as follows: Ground meat, one part; corn meal, two parts; middlings, one part; ground oats, one part; also a small proportion of bread soda and salt. Sometimes this is varied by a mixture of corn, oats, and wheat, ground together, and one-fourth ground meat added. Mashed potatoes, chopped cabbage, ground bone, and fresh meat, occasionally, are always in order. After the tenth day the food is simply scalded instead of being made into bread. Raw grain is seldom fed, though cracked corn and wheat are allowed as soon as the chicks will eat them.

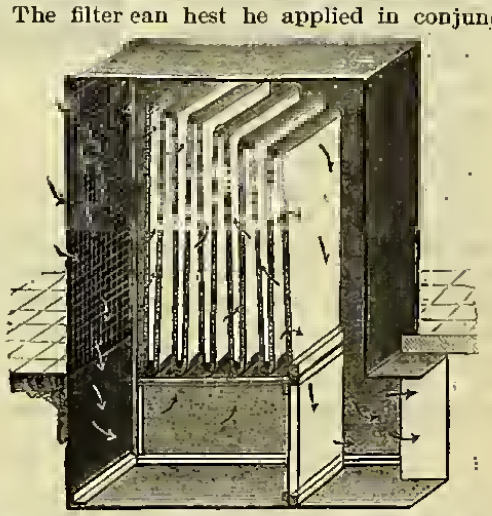
Particular attention is given to keep everything clean, and the chicks must at no time become chilled. On cold or damp days they are kept inside, but given the privilege of the yard on clear days. When they become too large to get under the mother, they will have become sufficiently hardy to do without, as the houses are warm. As Mr. Howe's house holds 2,800 chicks every 10 weeks, his capacity is 14,000 per year, and these are raised on less than one-eighth of an acre of ground; but it is customary to take a vacation in summer. He has hatched about 4,000 chicks, some of them selling for a dollar each, and is now preparing to hatch 3,000 ducklings. The cost of feed to produce one pound of chick is five cents, but the first pound is costly, as the expense of eggs, time of incubation, labor, etc., are important items. Mr. Howe does nearly all the work himself; but is sometimes assisted when very busy killing and dressing the chicks for market. He uses two stoves, which not only heat his brooders, but warm the incubator house, and boil water for the incubators.

There are quite a number of persons in Hammonton who raise broilers, but keep no fowls, as adult birds cause vermin, and cannot be allowed near the brooders. Mr. Howe is now considered very expert in testing eggs, and also as an operator of incubators. His chicks have brought not only the highest prices in market, but he has received many complimentary letters from commission merchants. He keeps cross-bred birds, but will, in future, grade up his stock with pure bred Plymouth Rock males. He has hardly been at the business long enough to be perfect yet. Although expending over $3,000, Mr. Howe has already received back nearly all of his capital, and expects to make a profit also.

As we stated, Mr. Howe has nothing for sale, though he always welcomes visitors; but as many readers may desire further information, we will state that Hammonton has a poultry association of nearly 60 members, of which Major Charles M. Jordan (late postmaster at Summerville, Mass.) is secretary, and he will kindly answer all inquiries or show visitors the farms. In describing Mr. Howe's place, we at the same time describe many similar, though smaller, establishments, while limited space prevents giving other methods which are in use; but none equal the hot water method. The total capacity of all the brooders in Hammonton is estimated at 50,000 chicks every 10 weeks, yet the prices are high, and the market far from being overstocked.—*Rural New-Yorker.*

AIR FILTER.

The object of this apparatus is to free the air which enters dwelling houses from dust and other impurities, more or less injurious to health and inimical to comfort. The filter can best be applied in conjunction



with the hot air system for heating. In this case, it is placed across the main channel, and all the air which enters the rooms must first pass through it, as will be seen from the illustration we annex. The filtering medium consists of a thick and coarse cotton cloth, wound in zigzag fashion over ledges forming part of a frame in a cast iron box. The direction in which the air passes is indicated by arrows. The surface of cloth exposed to the air must be large enough not to offer any sensible resistance to the current of air, as otherwise a partial vacuum would be created, and air be drawn in from other sources. This, of course, is undesirable, and it becomes a matter of importance to be able, from time to time, to clean the filter cloth, which is done either by simply beating or by washing. To facilitate the renewal and cleaning of the cloth, the internal frame is so arranged as to be removable with very little trouble. The air passes only once through the cloth. The filter is usually put into the cellar of the house which is to be supplied with pure air, and where a hot air system is employed, it is best placed in the main air duct. The filter is now manufactured in various sizes, varying from 56 sq. ft. to 1,100 sq. ft. of filtering surface, arranged to pass from 16,000 cub. ft. to 330,000 cub ft. of air per minute, and costing from £4 15s. to £32 10s. The difference of pressure between the two sides of the filter is only 0·08 of an inch water gauge.—*Industries.*

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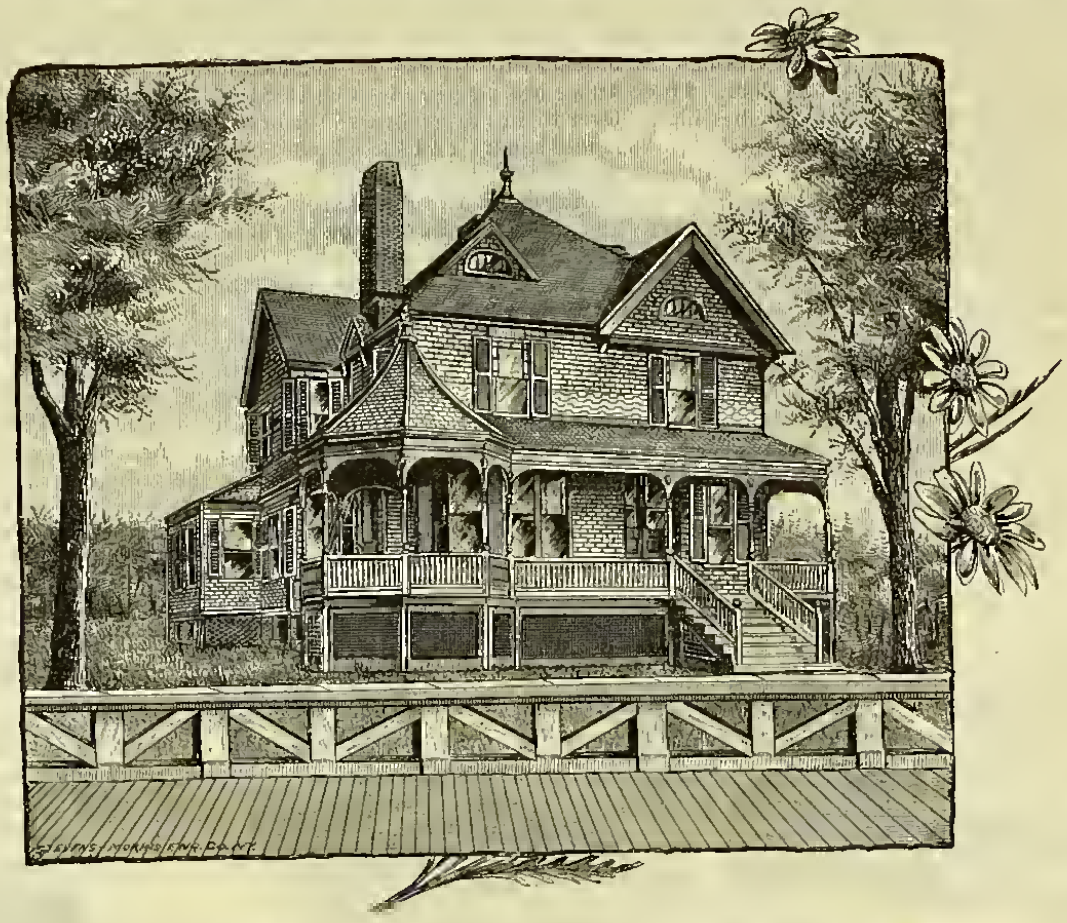
DWELLINGS AT CAMBRIDGE, MASS.

We give herewith illustrations of several comfortable dwellings at Cambridge, one on North Avenue, erected at a cost of about $7,000. It is elegantly finished. Another engraving shows a pretty cottage on Brattle Street, cor. Mercer Circle. Cost between $5,000 and $6,000. All of these houses might be duplicated at a considerable reduction from the above costs by omission of expense in certain parts of the interior finish.

Another is a double house, pleasing in all respects. Cost about $7,000.



A DWELLING IN NORTH AVENUE, CAMBRIDGE, MASS.

About Plumbing.

The mistakes made by people in speaking of plumbing work are sometimes painfully amusing to the plumber. Nine women out of ten, when they smell a disagreeable and unpleasant odor in the house, are positive that it is sewer gas, and must have the health inspector or the plumber at once to determine its source. Some time ago a lady called at a plumbing shop in a fashionable residence part of the north side. She wanted the plumber to send one of his men to the house at once and get her diamond earring, which had fallen into the wash bowl and had been carried into the waste pipe. The plumber asked her if there was a trap under the bowl, but seeing that she did not understand him, he asked her if there was a bend in the pipe below the bowl. She said there was, and "supposed that the plumber had too much pipe, and, not wanting to cut it, he bent it."

This will not compare with the sagacity of the lady who suddenly discovered the prevalence of sewer gas in the house. It may be just as well to remark right here that there is not a woman in Chicago who is not an expert on sewer gas. She can sniff it where it is not, where it has never been known, and probably where it never will be, but she is sure it is sewer gas. The lady mentioned above is the occupant of a second story apartment in a south side flat building. The plumbers were at work on the first floor. At noon one day the plumbers were eating their lunch, and one of them had some Limburger cheese, which he was boiling on a stick over an open fireplace. Naturally, the odor was somewhat stronger and, perhaps, somewhat more penetrating than usual. It was wafted up the chimney through the cracks and fissures and into the apartments of the family on the second floor. Suddenly the lady came down and wanted the plumbers to come up and find where the "sewer gas was escaping." She said the whole house was permeated with it. The plumber was responsible for "sewer gas" in that house at least.—*Sanitary News.*

Antiquarian Discovery.

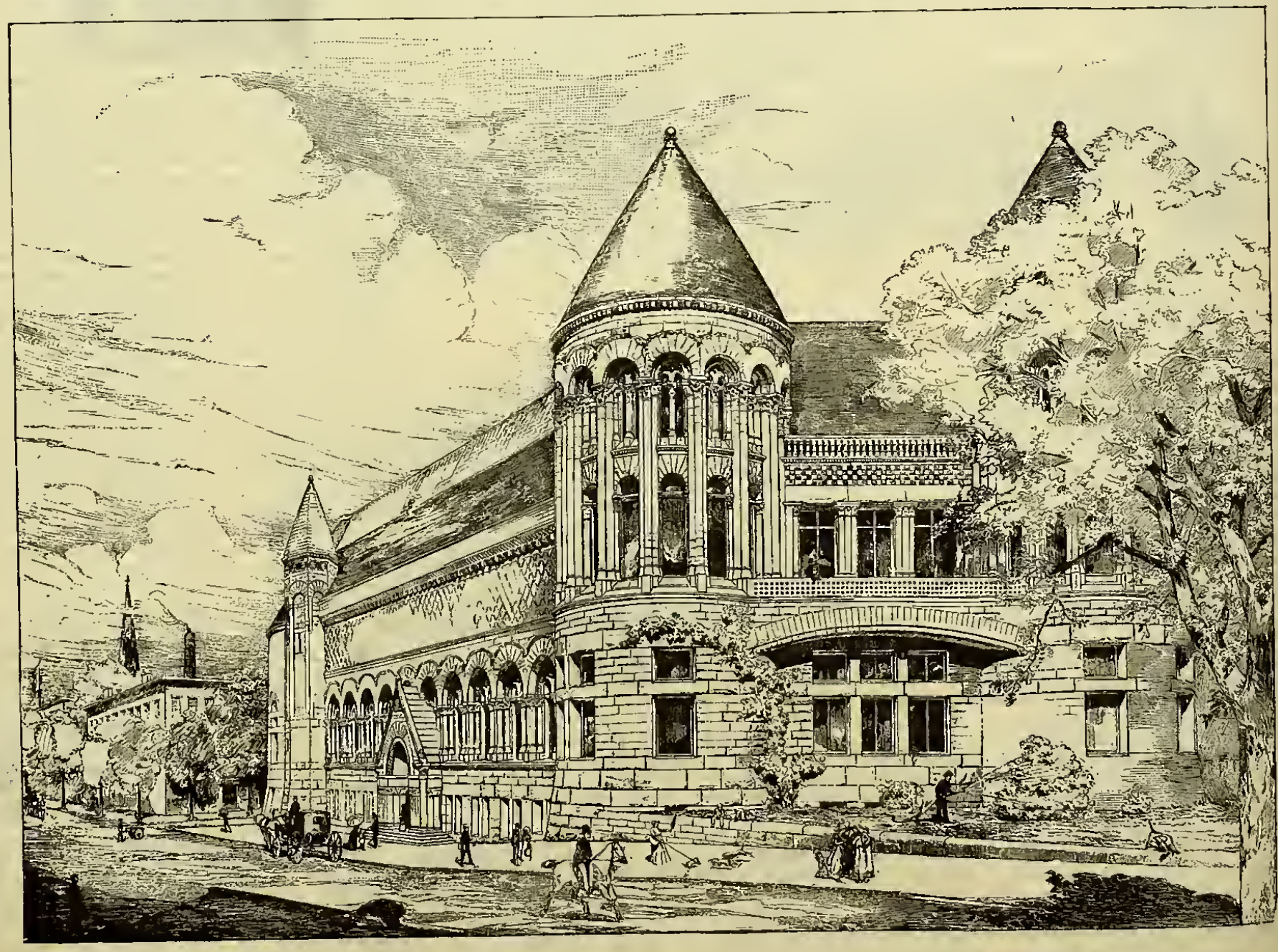
An interesting discovery was made recently at Winchester Cathedral during the construction of the monument to hold the skeleton of Bishop Courtenay. A workman, on making an opening in the choir wall, exposed De Blois' leaden coffer, in which that bishop had ensbrined the bones of his uncle Richard, the second son of the Conqueror, who was killed by a stag in the New Forest. Richard's bones were thus preserved by King Stephen's brother, and the coffer, after some seven centuries, remains perfect. The inscription denotes that the coffer contains the bones of Richard, but the words "Beorn Dux" lead antiquaries to believe that the coffer also holds the bones of Earl Beorn, nephew of Canute.

YOUNG MEN'S ASSOCIATION BUILDING, BUFFALO, N. Y.

We find in a recent number of the London *Building News* a drawing of this structure, designed by H. H. Richardson. The engraving hardly does justice to the architectural excellence of the work; but we reproduce it as given, on a reduced scale.

Common Uses of Woods in England.

More conversant with the living trees, their characters and habits, than with their uses, tree planters may perhaps have little interest in any detail of a subject somewhat outside their vocation; but apart from the picturesque or garden uses of trees, there is some importance to be attached to the uses to which trees can be applied after they have been cut down and manufactured for use. The oak is the grandest and most historical of all our forest trees. It has long been associated with our national defense as the chief element in shipbuilding, but harder and sterner iron has robbed the oak of this sentimental element, and the glory of our "wooden walls" of Old England has forever departed. Now the oak furnishes



DESIGN FOR YOUNG MEN'S ASSOCIATION BUILDING, BUFFALO, N. Y.—H. H. RICHARDSON, ARCHITECT.

the builder with the best material for door posts. Wheelwrights find in it the best wood for the bottoms of carts and wagons, and it makes the best of all wood fencing. Pollarded oak is a valuable element in the making of furniture, the knotted and intricately designed surface making the most elegant of veneering for what is known as oak suites.

To the elm is attached a melancholy and weird interest, inasmuch as it forms the small but solid inclosure in which dead humanity is placed. For commoner uses it is valuable for the making of wheel stocks, as it is not so liable to split, and enables the spokes to be fixed with any amount of force. It also enters into the construction of wide fellies, such as are employed in wheels for farm carts and heavy wagons. It forms a prominent element in the construction of that useful vehicle, the wheelbarrow, and the bodies of carts. It also enters into the construction of heavy hollows as boards, and in the form of seats to Windsor chairs it furnishes frequent means of rest to exhausted humanity.

Ash is a very valuable timber, and is fast getting scarce. It is not one of the favored ornamental timbers, and therefore is now much less planted than formerly. A dearth of ash timber would be productive of great inconvenience to many trades. Wheelwrights employ ash largely in the construction of carts and carriages. It forms the best material for shafts, and is widely employed in the making of all kinds of tool handles, especially those used in gardening, such as spades, forks, shovels, hoes, etc. In a less interesting way it is used for butcher's blocks, and many other common purposes.

The beech is a noble tree in life perhaps the most beautiful and decorative of all forest trees, but its uses in domestic life are not so varied as are those of some other woods. Beech is the chief constituent in the making of the elegant cane bottomed chairs found in the parlors of the poorer classes. It is useful for gun stocks, saddle trees in heavy harness, wheel fellies, and many of the lesser tool handles. Hornbeam is closely allied to the beech in life, but its uses are even less varied. Owing to its peculiar toughness it is often employed as cogs in mill gearing and in the construction of bearings, as its wear is regular and even. In another direction it administers to the employment of a section of the community—it makes the best of skittle pins.

The sycamore furnishes a peculiarly white, smooth wood, free from grain, and is used for the formation of curtain rings, butter churns and prints. For this latter purpose it is valuable, as it enables a finer design to be cut than does any other wood of home growth.

The lime in life is for a time the means of diffusing sweet odors and sweet sounds when the myriads of bees are seeking for its honey treasures. After death it enters into the production of other harmonies, as it is largely employed in pianofortes, where its value is seen in a comparative immunity from those fluctuations of contraction and expansion peculiar to most woods. Shoemakers find it also the most suitable material for their cutting boards, as it does not blunt the fine edges of their knives. The Spanish chestnut, also, is largely employed in the formation of sides for pianos, and at times is elevated as signboards. Formerly the chestnut was largely employed in the construction of principals and rafters for open roof churches, and is occasionally degraded to the common uses of posts and rails for fencing. The grand looking horse chestnut does not furnish a specially valuable timber, its wood being occasionally employed in the making of brushes. The birch, also, is employed in brush manufacture, and in the formation of hat blocks for hatters, also in the production of toys. In this way the tree becomes a source of pleasure to infantile life and a terror to breeched boyhood.

The fir tribes are productive of noble trees, but the timber is not of a specially useful kind. It is too soft, as indeed is the case with all wood that is the product of quick growth. Both the spruce and Scotch firs are of kindred quality, and are commonly employed in the construction of outhouses and sheds, or rafters to barns, and for temporary posts and rails, but, except where kept very dry, having only slight powers of endurance. If the pine tribes are to furnish the trees of the future, our posterity will find that in the matter of useful woods we have left them but an indifferent legacy. Larch is superior in enduring quality to the evergreen firs, and is therefore largely used as railway fencing and for ordinary estate and farm purposes. Yew wood is valuable when employed for veneering. It also makes most enduring gateposts. The maple is employed in the turning of bowls, and the bird's eye maple for the manufacture of furniture. Acacia is very hard and durable, and makes good ladder rounds and bottoms to carts. The poplars cut out good weather boarding, and are also employed in the formation of railway brakes, as the wood is woolly and tenacious. Walnut is valuable for the manufacture of furniture and gun stocks. Apple is used for wheel cogs, and the hard stems of the crab for beetle heads. Pear will dye black, and resemble ebony, and makes good walking sticks. The willow is famous for the production of cricket bats. The plum produces shuttles for weaving, and the cherry is used in the making of chairs. These are but a few of the many uses to which home raised woods are put, but for all our chief constructive purposes we give the preference to foreign timber.—*A. D., The Garden.*

A DWELLING ON BRATTLE STREET, CAMBRIDGE, MASS.

Sandstone as a Building Material.

Sandstones consist of small grains, chiefly silica, aggregated into a compact rock, the grains being cemented together by various substances. Sometimes it is carbonate of lime, sometimes silica or iron, and sometimes clay. The nature of the cementing mass has considerable influence upon the character of the rock. Iron is, however, the most usual, and the one which forms the most typical sandstone. There is a great variety of color, from white, through gray, yellow, red, and brown, to black.

Sandstones are of all geological ages, from the lowest sedimentary rocks to the most recent. The older rocks are usually the most compact, and in general contain some feldspar grains, and frequently a large quantity of clay, which gives them more or less of an argillaceous character. When sandstones are very hard, and their fracture harsh, and they contain small silicious pebbles, they are usually called grit. If the rock consist, not of grains of sand, but of numbers of pebbles cemented together, it is designated a conglomerate, which is further subdivided into pudding stones when the pebbles are rounded, and breccia when they are angular. And as these pebbles may consist of any kind of rock, there exists a considerable variety of these compound rocks, which are distinguished by the nature of the pebbles of which they consist. Sandstones are generally excellent materials for buildings; but, for this purpose, they should be firm and uniform in texture, and free from iron pyrites or iron sand, which would, by their rusting, not only spoil their appearance, but render them liable to peel off on exposure. Many sandstones, especially those from the thick beds of what is called the new red sandstone (or from the variety of colors from white to dark brown which it exhibits, the variegated sandstone), and which lies above the coal measures, are exceedingly soft when first quarried, but gradually become hard when exposed to the atmosphere. Others, again, especially those rich in clay, although compact and hard when freshly quarried, crumble away rapidly on exposure. The durability of this class of stone depends, however, very much upon the nature of the climate. Any sandstone which will bear exposure for some weeks, after being saturated with a solution of Glauber's salt, may be considered fit for use.

W. K. SULLIVAN.

Japanese Tea.

In the "Proceedings of the German Naturalists' Society for Eastern Asia," held at Yokohama, Messrs. Kellner, Makino, and Ogasawara give some interesting details of the mode of preparation and composition of Japanese tea. They state that the preparation differs from that of Chinese tea, chiefly in this: that the leaves are not intentionally allowed to ferment, but after moistening and cooling are at once placed in the oven; and also that the prepared tea is not flavored with fragrant flowers. The amount of theine is from 2 to 4 per cent; of tannin, 17 to 20 per cent. The aqueous decoction contains chiefly tannin, theine, and mineral substances.

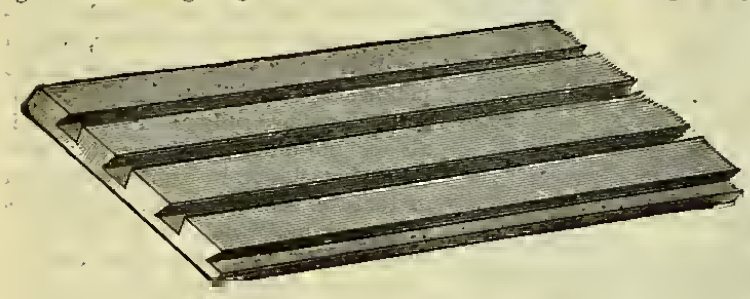
As is the case with all alimentary substances which are chiefly valued for their taste and fragrance, chemical analysis gives but little indication of the value of tea for commercial purposes. The evergreen organs of the tea plant exhibit phenomena during their first period of growth very similar to those which take place in the leaves of conifers; and, like them, they retain, even when old, a large quantity of proteinaceous substances and carbohydrates. It is true that, in consequence of the fresh formation of organic substance, the amount of nitrogenous constituents, including theine, diminishes slowly and regularly, as also the soluble non nitrogenous substances, while the fatty constituents accumulate rapidly, and to a remarkable extent, apparently in consequence of the formation of wax. The amount of woody fiber increases very rapidly during the first weeks, and after that remains nearly constant. The greatest changes are exhibited in the composition of the ash; the proportions of potash and phosphoric acid diminish very rapidly, while those of lime, magnesia and oxide of iron increase.

A DOUBLE HOUSE, CAMBRIDGE, MASS.

HALL'S PATENT SHEATHING LATH.

It has been said, and with a good deal of truth, that the public generally are slow in adopting new construction and new methods. Architects and owners are too apt to run in the same groove, and neglect to make themselves acquainted with the various new articles of manufacture placed from time to time upon the market. Of course, it cannot be expected that every trumpery and unimportant invention should receive investigation, but there are not a few improvements brought out in recent times of which the merits and advantages are so considerable that every architect and owner, in fact, every person building, would find it to their benefit to look well into.

Just such an article is Hall's combined lath and sheathing, which is designed to supersede ordinary lathing. It consists of pieces of lumber, of any length and width, having a series of dovetailed parallel grooves running lengthwise, as shown in the cut. This



HALL'S PATENT SHEATHING LATH.

sheathing is nailed on to the studs or furring, and is then ready to receive the plaster directly upon it.

The advantages of this new construction are several. First, it is cheaper, for it effects a saving of twenty-five per cent of the mortar and a good deal of labor in putting on. A mason can put on as much as fifty yards more of mortar a day than he can on ordinary lathing, so that, if for no other reason, the fact of its being cheaper gives it a decided advantage. But then it makes a much more solid and warmer wall, the dovetailed grooves give a better clinch to the mortar, and, above all, it will not crack.

The last advantage is one which, although it does not, perhaps, appear so obvious as some of the others, has, nevertheless, been proved to be a fact. No plaster job ever executed is entirely free from small cracks here and there, and with this sheathing, although some slight ones might appear, they would certainly be less in number than with ordinary lathing, and this has been shown to be the case in many instances where a job has been executed by the same mason and with the same mortar on the two different lathings.

But, beyond the very decided and important advantages already pointed out, there are others of not less moment. Of these, the foremost is the great aid the sheathing lends in increasing the strength of the structure. It is especially adapted for ceilings under floors, when strength and solidity are required, and for city ceilings and expensive buildings where cornice and center-pieces are put up. It ties the joists firmly together, prevents, to a great extent, all warping and twisting, and stiffens the floor and ceiling sufficiently to obviate the necessity of bridging.

Sheathing lath has evidently come to stay. Its use is every day increasing, and it will most probably, before long, be very generally employed. The manufacturer is I. G. Jenkins, of Oswego, N. Y., who supplies not only the sheathing, but also the machines for making it.

ALL who are interested in fireproof buildings and building materials should be familiar with the different kinds of hollow brick, porous terra cotta, flat arches, partitions, furring, etc., manufactured by Henry Maurer & Son. Their system of iron beam protection by means of hollow brick has been adopted in the new building of the Equitable Life Assurance Society, the Potter building, and other of the most important structures in the city. The office and depot of the company are at No. 420 East Twenty-third Street, this city.

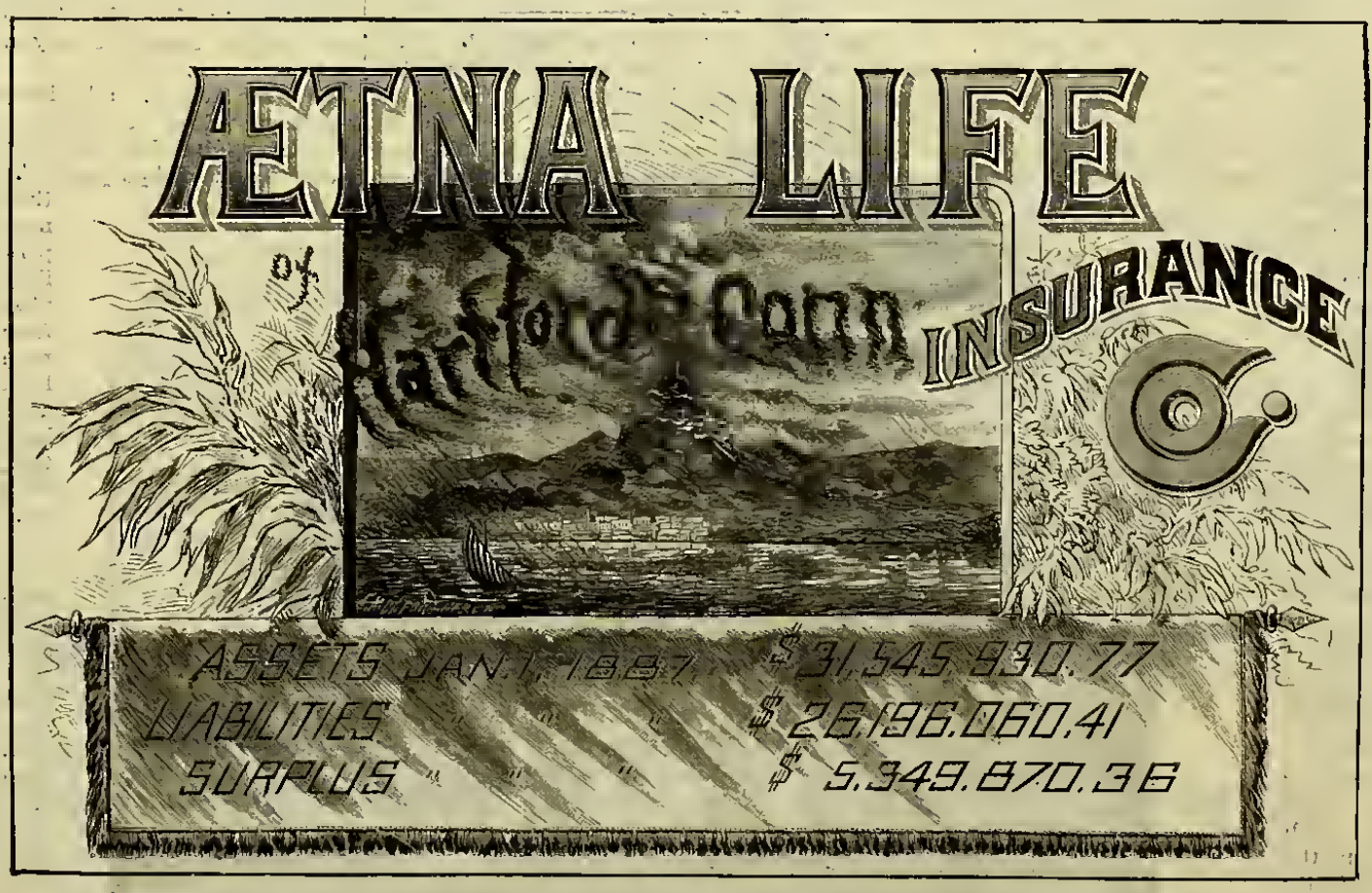
Red Granite.

Near Assouan, Egypt, there are immense deposits of red granite, which furnished much of the material used by the ancient Egyptians in the making of obelisks and other monuments, which have since found resting places in various parts of the civilized world. The great obelisk of Luxor is now in the Place de la Concorde at Paris. Its height in the socket is rather more than 72 ft. Another of these monuments, known as Cleopatra's Needle, is a familiar object on the Thames Embankment in London. There are several in Rome, and one in New York (in the Central Park). The enormous size of some of these monuments, cut out of a single stone, has made them the wonder of all ages; more especially when the mechanical means at the disposal of the engineers of that era have been considered. An obelisk, still lying in an unfinished state in the quarry of Syene, shows us how these great monoliths were quarried. The obelisk was cut out in the solid rock, and polished on three sides before the fourth was disengaged; wooden wedges were then driven in the under side of the stone, and these were repeatedly moistened until they swelled sufficiently to effect separation from the bed below. From inscriptions and diagrams carved on some of the pedestals, we gather that the mode of transport to Lower Egypt was by the Nile, the stones being loaded on rafts. They were then dragged to the place where they were to be erected on a rude kind of carriage made of logs, which was set in motion by large trains of men and animals; they were finally lifted on the pedestals by means of an inclined plane. The lasting capabilities of Egyptian granite are proved by the sharpness of the sculpturing on the obelisks, which in some cases was cut as much as 3,000 years ago. It is, however, a curious fact that the same stones when set up in London and New York have shown signs of decay within a very few years of their erection.

BE WISE IN YOUR SELECTION.

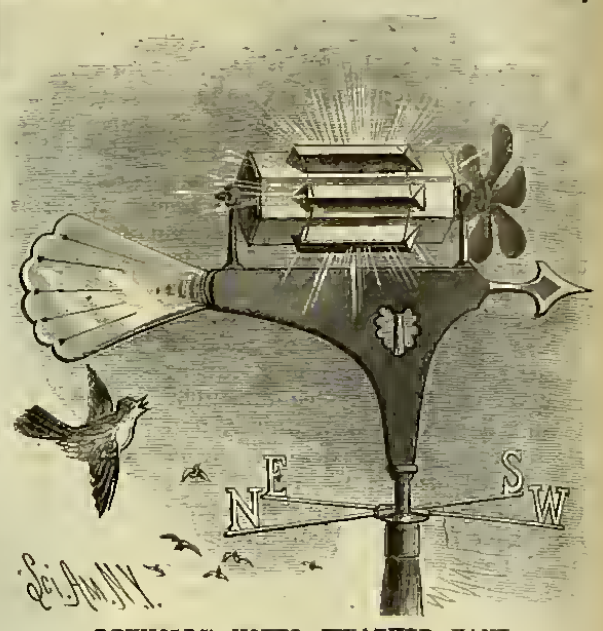
If it is known that a business man does not insure his property, his standing is impaired with those of whom he asks credit. It should be so; for no man should hazard property when by the payment of a small sum he can be secured against the ravages of fire or the damage by water. Successful business men regard life insurance as of vastly more importance than fire insurance. Property may never burn, but death is sure to occur.

It certainly pays to secure the best, when it can be obtained at the least expense. The Ætna Life Insurance Company, of Hartford, Conn., through its conservative management and successful business, is giving to its patrons, upon its admirable plans (two of which are copyrighted), the best results obtainable in the business. If you desire to know of the particulars of this company, and the peculiar advantages it offers, you will do well to address it at Hartford, Conn.



A NOVEL WEATHER VANE.

A decided departure from the ordinary type of weather vane may be secured very simply by following the construction shown in the accompanying engraving. A hexagonal barrel, with sides of mirrors, is mounted on its axis as shown, and a propeller or helix is connected with it at one end, whereby a rotary



REYNOLDS' NOVEL WEATHER VANE.

motion is imparted to the barrel by the action of the wind. Prisms are wired to the sides of the mirrors, which give to the rays a rainbow-like hue which is dazzling in the extreme. This contrivance has been devised by Mr. R. B. Reynolds, of Stockport, N. Y., and it possesses a novelty which will commend it to the attention of those seeking something quite unique in this line.

The Richmond Weather Strip.

The Richmond Weather Strip Company has just closed a contract with the Pennsylvania Railroad Company for the use of their improved car door weather strip on all passenger coaches on the main line and branches and all its leased roads.

As the Pennsylvania company is ranked as the highest authority in all matters of railway improvements, it is only reasonable to predict that this valuable improvement will go into general use on the passenger coaches of all the railways as an item of comfort and economy, which opens up a big future for the Richmond Weather Strip Company, and is a high compliment to the energy, skill, and business capacity of Mr. Frank Dennis, who has had the entire management and control of the business from its beginning.

Vegetables in Japan.

The Japanese are almost vegetarians; not so much from choice, perhaps, as from necessity, though the eating of flesh is, in a great degree, forbidden to those who are religiously faithful. Fish is not among the prohibited articles of diet. Most of the flesh prepared for food is for the infidel. In 1880, in the whole of the empire, there were but 36,600 head of cattle slaughtered—the half of which was used by the foreigner. Nine-tenths of the food used consists of vegetables. Rice is the chief article—beans, peas, and sweet potatoes are largely consumed. A fourteen pound radish is very popular, and numerous sea weeds are used as food.—*Gardeners' Mon.*

FULL plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.

SCIENTIFIC AMERICAN

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ARCHITECTS AND BUILDERS EDITION.

Vol. IV. Subscription, $2.50 a Year. NEW YORK, AUGUST, 1887. Single Copies, 25 Cents. No. 2.

RESIDENCE, CORNER OF EIGHTH AVENUE AND BERKELEY STREET, BROOKLYN.

This house was designed for Mr. H E. Beguelin by F. Carles Merry, architect, of New York.

It is built mainly of brick with terra cotta trimmings, except the first story front on Eighth Ave., which is of Euclid stone.

RESIDENCE CORNER EIGHTH AVENUE AND BERKELEY STREET, BROOKLYN.
F. CARLES MERRY, ARCHITECT.

The entrance doorway has been treated in Romanesque.

The entrance hall and staircase are designed in a very original manner, in "Old Colonial," of cherry.

The parlor is finished in mahogany. The dining room is of oak, while the library walls and ceiling are entirely wainscoted in oak of very pleasing effect. The upper stories are finished in cherry and ash.

The building, which is elaborately decorated throughout, has a frontage of 40 ft. on Eighth Ave. and of 47 ft. 6 in. on Berkeley Place, and was erected at a total cost of $35,000.

Seven-foot-four Circulars.

It takes perfection to bar out improvement, and it is often taken for granted that an article of manufacture is perfect when it is not. The circular saw is a thing of slow growth. Various trade papers insist in keeping on deck an item to the effect that a man named Cummings, whose remains rest near Kalamazoo, Mich., was the inventor of the circular, notwithstanding it was invented before Cummings was born, and possibly before Cummings' father was born. It is within forty years, however, that the circular has become a success in the saw mill. Within that period circulars placed in Michigan mills were not satisfactory, and were made to give place to the straight saw. At first the thicker the saw, the better. It had never entered the mind of man that a thin saw would answer the requirements. Gradually saws of larger diameter and thinner gauge were made. It was discovered that speed gave backbone to a saw. The latest achievement in saw making is a circular eighty-eight inches in diameter—the largest ever made—and of eleven gauge. It was manufactured by E. C. Atkins & Co., Indianapolis, Ind., and is in use in the mill of Hurd & Co., at, or near, Xenia, Ind. One may properly ask, What next? Will the time come when circulars will be made so large that no double or three saw rigs will be necessary for converting the monstrous redwood logs into lumber?—*N. W. Lumberman.*

MARBLE may be stained or dyed of various colors by applying the solutions mentioned below to the stone, made sufficiently hot so that the liquid will just simmer on the surface. Blue, tincture of litmus; brown, tincture of logwood: crimson, a solution of alkanet root in oil of turpentine; green, tincture of sap green; red, tincture of dragon's blood or cochineal; yellow, tincture of gamboge or turmeric. Success in the application of the colors requires considerable experience.

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A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in eolor are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

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Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

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A $4,000 RESIDENCE AT FLUSHING N. Y.

SPECIFICATIONS.

Quality.—All the material used to be of good quality, free from all defects impairing its strength or durability.

All timber, except where otherwise specified, to be of good, well seasoned spruce.

Sizes.—Girders to be 6"×10", flush with top of beams. Sills to be 3"×8". Plates and interties, 4"×4". Posts to be 4"×6". First and second floor beams, 2"×10". Third tier, 2"×9". All 16" on centers. Rafters, 2"×6"; hip and valley rafters, 3"×8"; 24" on centers; all studding, 2"×4"; 16" on centers. Bearing strip, 1¼"×6". Ridges, 2"×8".

Framing.—All studding placed 16" on centers. All door and window studs to be doubled, bridged once on each floor. Partition studs to rest on partitions below, where possible, and not on the floor beams. Spike a 2"×4" beam to side of girder for floor beams to rest on, and spiked well thereto. All headers and trimmers to be doubled; all beams under partitions running parallel with same to be doubled; the entire frame to be mortised and tenoned and pinned together.

Sheathing.—The entire frame, from wall to plate, to be sheathed with 1" matched hemlock boards, put on diagonally, and well nailed at every post and stud; this to be covered with No. 30 manila building paper, well lapped, and laid under door, window frames, and corner boards.

Flooring.—First and second story floors, except kitchen and bath room, to be laid with narrow pine flooring, well driven together and nailed to each and every beam. Attic to be pine, 9½" wide, well driven together, and nailed to every beam. Kitchen and bath room to be laid with white maple, 2½" face.

Siding.—Cover entire building, except where otherwise shown in drawings, with sound and clear No. 1 beveled clapboards, not less than 1" lap, nailed every 16", and set nails for putty. Do all necessary furring; set grounds for all doors. Shingle the vertical sides where shown with XXX 18" pine shingles, laid not more than 5" to the weather.

Roof.—The roof is to be sheathed with rough hemlock boards; valley and gutters to be lined with the best I. C. charcoal tin; all joints to be carefully soldered. Do all necessary flashing around chimneys, dormers, bay windows, porches, etc., also counterflash all chimneys and junctions. Slate the entire roof with 16"×8", royal black slate, not less than 3" lap. Put up where required three tin leaders, connected with drains where directed.

Piazza.—The sills and bearing timbers for porches to be 3"×6", floor beams 2"×6", placed 20" from centers, notched into the sill and well nailed; the floors to be 1" thick, 4½" wide, laid in white lead and blind nailed. Steps to have 1¼" treads and ⅞ risers; the roof to be ceiled and tinned; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details; the piazza to be ceiled on the under side, part raked and part on level, with 3" beaded ceiling, ⅞ thick, beams, "×4".

Blinds.—All windows, except cellar and attic, to have 1¼ outside blinds, made, hung, and fastened in the best manner, painted at the factory three coats. The bay in reception hall, dining room bay, parlor bay, and bay over hall to have Venetian blinds, with cornice made of stained wood, hung complete.

Exterior.—The water table, corner boards, cornice, window frames, bay windows, porches, and all other exterior ornamental work to be made of the best quality of white pine, in accordance with the drawings and details.

Window and Door Frames.—Window frames to be made for 1¼" double hung sash, with 1¼" pulley and hanging stiles; 2" sills and ⅞ subsills; 2" axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside, and hung at top with 3" narrow butts and proper fastenings.

Door frames to be made of 1¼" plank, with rabbeted jambs; outside doors to have 1¼" outside casings.

Sashes.—All sashes, except cellar, to be 1½" thick, dimensions and number of lights as shown in drawings; to be glazed with second quality French double thick glass; cellar to be glazed with third quality. The double hung sash to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts, size and number as per plans. Window on stair platforms to be stained cathedral glass, leaded in, designs selected by the owner, to cost $1.25 per square foot.

Doors.—The front doors to be 2" thick, moulded as per plans, upper panels to be glazed with stained cathedral glass, to cost $1.25 per sq. ft., selected by the owner, hung with 4½" lacquered loose butts, fastened with 4½" mortise lock; night latch attachment, brass face, wooden furniture and escutcheons, brass flush bolts top and bottom. Sliding doors, to roll on Hatfield's patent 4" anti-friction sheaves, astragal face mortise locks, flush trimmings, bronze or brass. Closet doors 1¼" thick, panded and moulded one side, hung with 4" lacquered butts, fastened with 4½" mortise lock, wooden furniture, etc., for principal part of first story and hematite for second floors, white porcelain for kitchen, closet doors to have reverse bevel rim locks. All doors, where needed, to have rubber-tipped base pins and ash saddles.

Stairs.—Build the stairs as shown on the plans, from first to second story with 1¼" treads, ⅞ risers, and 1¼" strings, to be put up in the best manner; the steps to be wedged with glue and supported on strong carriage timbers. Newels, balusters, and hand rails to be made of cherry, as per details, all the treads and risers to be tongued and plowed together. Cellar stairs to be rough spruce plank steps housed into strings. The flight from second to third stories to be inclosed, as shown, with door at bottom hung complete. Fur off all soffits of stairs complete for lathing.

Trimmings.—The architraves for all doors and windows throughout the house to be made 5" wide moulded on face. First and second stories to have turned corner blocks, the bases to be 7½" wide, moulded on top. All to be of well seasoned and clear white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on two sides as directed. China pantries also to be fitted up with shelves, doors, and drawers complete, as directed. Bed room closets to have one shelf with strip fitted with japanned hooks for coats and hats. All these shelves to rest on rabbeted cleats all around.

Kitchen Wash Trays, etc.—Wainscot kitchen 3' 0" high, 4' 0" behind sink, with narrow beaded yellow pine ceiling, with nosing and cove finish. Furnish and fit up in kitchen two wash trays made of 1½" clear lumber, dadoed together with white lead, covers hung complete.

Bath Room.—Bath tub to have ash top; skirt the front of bath tub with narrow headed ceiling. Wainscot bath room 2' 0" above the fittings all around, nosing and cove finish, ceil in front of wash bowl, and hang door complete, with catch. Put up water closet, with seat riser, and lid hung with brass butts.

Grading.—The owner will do all grading.

Mantels.—The dining room, parlor and one bedroom on second floor to be furnished with mantels and grates, of the prime cost in all, including setting, of $175, to be selected by the owner.

Cutting, etc.—Furnish and put up all necessary pipe boards for plumber to screw his pipes to, do all necessary cutting for gas fitters, plumbers, and heater men.

Picture Moulding.—Put up picture moulding in principal rooms, first and second stories and halls, wood to match that of rooms, 1½" wide.

Back Panels.—All the windows on the principal part of first story and stair platforms to have panel backs and moulded stool, all other windows to have neat moulded stools and aprons. Furnish and hang a 5" gong bell in front hall complete. The pull to match front door knobs.

Cellar Door.—Put up outside cellar door as shown, of narrow beaded ceiling, put together with wrought nails, hung and locked complete.

Hang Shelf.—Put up hang shelf in cellar where directed, of wide ceiling and good strong hangers, 3' 6" wide by 8' long.

Coal Bins.—Put up coal bins where shown or directed, of planed hemlock boards and 3"×4" stanchions, one bin for furnace coal and one for range, each to have small door for access.

Air Box.—Build cold air box as directed by the furnace man, of wide pine ceiling boards, with wire over entrance space through wall.

Painting.—All the exterior woodwork usually painted to be painted two good coats of white lead

and linseed oil paint, all knots and sap to be well shellacked before priming; all cracks, joints, and nail holes and over nail heads to be well puttied after priming is done. All tin work to have two coats of Prince's metallic paint; also paint the chimney two coats. All the colors to be selected by the owner. The blinds will be painted at the factory. The interior will be wood filled with Wheeler wood filler, then two good coats of hard oil finish. The first story and main stairs and balusters and rails will be rubbed down to a smooth surface. The second story will not be rubbed down. All the doors, saddles, hearth borders, and hard floors will be oiled; all sash and outside doors must be painted on top and bottom. The painters must follow immediately after the carpenters.

MASON'S SPECIFICATIONS.

Excavations.—Proper excavations of depth as shown on plans, or the cellar proper, to be about 4½' deep, all piers and foundations 2' 6" deep. Stoop foundations 2' 6" deep, also footing course under foundations 4' deep. Earth and rubbish to be removed where directed. All water that may accumulate during the excavation, from any cause whatever, to be removed at once and the premises kept dry.

Stonework.—The cellar walls to be hard burnt brick, those generally used in the vicinity, 8" thick to the full height of cellar, which will be 7' in the clear, and to be laid as shown in cement and lime mortar, with sharp sand, all to be neatly pointed inside and out, every seventh course to be headers. All angles and corners to be perfectly plumb and the walls level on top. Cement the entire cellar bottom with best Rosendale cement, gravel, and sharp sand, at least 3" thick, well smoothed over on top, the cellar wall to be faced on both sides, the outside to be cemented from bottom up. foundation under walls to be solid grouting 4" deep.

Brick Piers, etc.—Build brick piers where shown on plans, of good hard burnt Jersey brick, of dimensions indicated on plans. All piers outside to be excavated for at least 2' 6" deep, and filled in with small stone and well hammered down to a solid bed.

Stoop Stones.—Put down stoop stones where shown, with foundations at least 2' 6" deep and filled in with small stone; on this lay flags in two lengths and 2' wide, to be full length of each and every stoop. Turn trimmer arches to all fireplaces. Furnish and set bluestone sills to all cellar windows. Furnish and set bluestone steps where shown with brick risers and stone cheeks and copings.

Chimneys, Flues, etc.—Build chimneys as shown on plans, of good hard burnt brick. The joints of all flues struck smooth and capped with bluestone caps, 3" thick, with holes cut in. The kitchen fireplace jambs to be built of Trenton front brick, laid in red mortar. Furnish and set bluestone shelf, and hearth rubbed smooth for kitchen. Furnish and set three thimbles where directed.

Drain Pipe.—Connect a 4" drain tile from inside of cellar wall to cesspool. Run 4" drain tiles from leaders and connect with cesspool pipe at the nearest point.

Vault.—Excavate and build privy vault where directed, of brick 4' deep, and to project back 2' in rear, this opening to be covered with a box neatly fitted.

Plastering.—The entire house to be lathed and plastered, except cellar. The attic rooms and closets to be laid on with one coat and hard finished; all the others to be regular three coat work and all hard finished, except dining room, parlor, library, first and second story hall, also soffits of stairs. These to be sand finished in the regular way, and all done in the very best manner, using the best materials. The mortar to lie at least one week before using.

The mason will make all his work good after all other trades are done, and leave the building broom clean immediately after the plastering is done.

This specification is intended to cover all mason's work, to fit the building ready for occupancy as per plan, but should anything have been omitted necessary to that end, it must be done without extra charge.

PLUMBER'S SPECIFICATION.

Drain.—Furnish and put in where shown on the plans a 5" cast iron soil drain pipe, to run from inside of building out to the tile drain, 4' outside of the building.

Soil.—Furnish and connect with the soil drain in cellar a 4" cast iron soil pipe, and run same size up and out of roof at least 4', and cap the same with the "Smith" patent ventilating cap. Use Y branches for all waste connections. All the iron soil pipes to have a coat of asphaltum. The soil pipe to have a cleaning out cap in cellar.

Calking.—All joints of all iron pipes are to be thoroughly calked with picked oakum and molten lead and screwed in position with iron hooks. All joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipes, and the lead pipes to be soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on the plans a 35 gallon round head, heavy pressure copper boiler, and provide with draw cock for emptying the boiler, and shut-off cocks for shutting off water from second story, and provide with circulating pipe, complete. Connect boiler draw cock with the sink waste, have a ⅝" stop cock on the supply pipe and combined safe and vacuum valve on top of the boiler. Boiler to be supplied with a Lockwood stand.

Supply.—Tap and pay for tapping the water main, and connect a ⅝ *aaa* supply and run to the boiler. Supply to have a shut-off cock inside the cellar wall. All pipes are to be graded so they will drain perfectly dry—each floor to be controlled separately by shut-off cocks. Where pipes will not drain dry, put in small pet cock. Run a ⅝" *aaa* lead pipe to and through cellar wall to a point where directed, and furnish and fit a stop cock both on the inside and outside of building.

Sink.—Furnish and set up where shown in the kitchen an 18"×30" Mott's Eastlake galvanized iron sink, with back air chamber and iron legs, and supply with hot and cold water through ⅝" *aaa* lead pipe and Fuller cocks, and have 1½" X lead waste pipe, properly trapped and connected with the drain with a 2" iron pipe to the main soil pipe. To have a cleaning cap on end of pipe under sink.

Bath.—Furnish and put up, where shown, a 16 oz. sheet copper bath tub, 5' 6" long, well tinned and planished. Supply with hot and cold water through ⅝" AAA lead pipe and nickel plated combination bath cock with rubber spray, to have 1½" X waste, and properly trapped and connected with the soil. Bath to have nickel plated plug and chain. Overflow to be connected with waste.

Bowl.—Furnish and set where shown on the plan a 14" marble Italian ware wash bowl, with marble countersunk top and sub-bases, 10" high. Supply with hot and cold water through ½" AAA lead pipe and nickel plated Fuller patent basin cocks, to have 1¼" X lead waste properly trapped and connected with the soil, to have nickel plated chain and stay and plug.

Air Chamber.—No cocks to be placed at the end of a line, but the pipe to be extended so as to form an air chamber.

Closet.—Furnish and set in the bath room where shown on plans, supplied with water through 1¼" pipe from cistern above, an inodorous porcelain wash out closet with suitable size cistern. The cistern to have the flush tank attached. Supply through ⅝" *aaa* pipe, and have cistern valve and rubber ball complete. Ventilate the closet with a 3" lead pipe, connected with the iron vent. Closet cup and pull to be nickel plated, and to be inserted in the seat. Closet to have enamel drip tray.

Safe Pans.—The bath tub, bowl and closets are to be provided with 2½ lb. lead safe pans, edges turned up 2" all around, and to have a ¾" lead waste pipe to the cellar.

Wash Trays.—Supply the wash trays with hot and cold water through ⅝ *aaa* lead pipe and Fuller patent cocks, with flange and thimble. Provide with a 2" main waste pipe, properly trapped and connected with main soil pipe, also all necessary plugs and chains and flanges, also provide on end of pipe a cleaning cap.

Ventilation.—Every trap through the house to be separately and independently ventilated from the crown by the same size as the trap.

Gas Pipe.—Put up the gas pipes with outlets where shown on the plans, and according to the rules of the gas light company. All outlets are to be capped and all pipes tested. All side lights are to be not less than 5' 6" from floor. All drop lights are to be hung plumb.

Range.—Furnish and set in kitchen a No. 70 Boynton's "Newport" range. Connect water back to boiler, fit smoke pipes, etc., complete; also furnish and fit in sheet iron throat pieces in chimney, with hole and slide complete.

Heater.—Furnish, and erect in a good, substantial, and workmanlike manner a No. 8 "Economy" warm air heater, with double casings, of J. F. Pease Furnace Co.'s manufacture, 206 Water Street, New York, to heat the first and second floors at 70° F. Provide Tuttle & Bailey's black japanned bordered registers of the following sizes: Hall, 10"×14"; parlor, 9"×12"; dining room, 9" × 12"; chambers (three), 8"×10"; bath, 7"×10".

The smoke pipe to be of galvanized iron, and all tin pipes to be IX bright charcoal tin. All tin pipes to have proper dampers near furnace, also patent damper in smoke pipe with regulating chains. Finish and complete the apparatus in all respects, and leave the same in perfect working order.

BILL OF MATERIALS.

1	girder	6"×10"×20'=	100 sq. ft.
1	"	6"×10"×16'=	80 "
1	piece	3"× 8"×19'=	38 "
3	"	3"× 8"×14'=	84 "
4	"	3"× 8"×18'=	144 "
3	"	3"× 8"×16'=	96 "
1	"	3"× 8"×19'=	38 "
1	"	3"× 8"×13'=	26 "
1	"	3"× 8"×14'=	28 "
1	"	3"× 8"×20'=	40 "
1	"	3"× 6"×21'=	32 "
1	"	3"× 6"×19'=	29 "
1	"	3"× 6"×22'=	33 "
1	piece	3"× 6"×16'=	24 sq. ft.
7	"	2"× 6"×16'=	112 "
30	"	2"× 6"×18'=	540 "
36	"	2"× 6"×12'=	432 "
6	"	2"× 6"×22'=	132 "
5	"	2"× 9"×18'=	135 "
13	"	2"× 9"×26'=	507 "
11	"	2"× 9"×24'=	396 "
3	"	2"× 8"×12'=	48 "
1	"	2"× 8"×22'=	29 "
1	"	2"× 8"×16'=	21 "
10	"	4"× 4"×12'=	160 "
1	"	4"× 4"×20'=	27 "
3	"	4"× 4"×15'=	60 "
7	"	4"× 4"×16'=	147 "
6	"	4"× 4"×14'=	114 "
2	"	4"× 4"×18'=	48 "
11	"	4"× 6"×22'=	484 "
13	"	2"×10"×18'=	390 "
32	"	2"×10"×26'=1,387	"
0	"	2"×10"×24'=	240 "
6	"	2"×10"×12'=	120 "
1	"	2"×10"×20'=	32 "
2	"	2"×10"×17'=	58 "
6	"	2"×10"×14'=	140 "
4	"	2"×10"×28'=	187 " =6,730 sq. ft. At $19 per M,	$127 87
300 pieces 2"×4"×12'=2,400 sq. ft.			
300	"	2"×4"×13'=2,600 "	=5,000 sq. ft. at $14 per M,	70 00
75 lineal feet, 1¼"×6" rough spruce				1 50
3,000 feet matched hemlock for sheathing hay and piazza roofs, at $19 per M				97 00
1,850	"	6" siding at $25 per M		46 25
1,700	"	rough sheathing for roof, at $14 per M		23 80
1,700	"	slate, main roof, at 7 cents per foot		119 00
2,000	"	No. 30 manila paper at		10 00
135	"	main cornice ready to put up, at 25 cents per foot		33 75
400	"	1¼"×5" corner boards, etc., at 4 cents per foot		16 00
175	"	short gable cornice ready to put up, at 8 cents		14 00
500	"	vertical shingling, 6 cents per foot		30 00
125	"	band cornice ready to put up, at 8 cents per foot		10 00
65	"	piazza plate and cornice, at 18 cents per foot		11 70
120	"	water table at 6 cents per foot		7 20
65	"	piazza facia and cove, at 4 cents per foot		2 60
28	"	front piazza rail, at 35 cents per foot		9 80
15	"	back piazza rail, at 20 cents per foot		3 00
28	"	front front piazza filling, at 12 cents per foot		4 56
12 brackets front piazza, 12"×12"×2", at 30 cents each				3 60
4	"	back piazza, 12"×12"×2", at 30 cents each		1 20
2 short posts, back stoop, at 75 cents each				1 50
3 brackets for bay windows, at $1 50 each				4 50
2	"	front piazza gable, at 75 cents each		1 50
1 back piazza column				1 50
5 front piazza columns, at $1 75 each				8 75
3 stoops, ready to put up				13 00
325 feet piazza floor, at $35 per M				11 37
325	"	piazza ceiling at $35 per M		11 37
Outside cellar door, ready to put up				4 00
45 feet lattice				12 00
6 finials, at 75 cents each				4 50
220 feet 20 ft. tin gutters and valleys, at 10 cents				22 00
300	"	tin roof, at 6 cents per foot		18 00
75	"	3 ft. tin leader, at 12 cents per foot		9 00
8 cellar windows complete, with sash				10 00
17 first story windows complete, at $9				153 00
Extra for Venetian blinds				30 00
15 second story windows complete, at $8 25				123 75
Nails, etc				35 00
11 third story windows complete, no blinds, $5 each				55 00
12 first story doors, complete, $6 50				78 00
10 second story doors, complete, at $5 50 each				55 00
3 third story doors, complete, at $3 50 each				10 50
300 feet picture moulding, at $1 50 per 100 feet				4 50
3,000	"	flooring for three floors, at $25 per M		75 00
275	"	yellow pine floor, at 3½ cents per ft		9 62
40	"	wainscot for kitchen, at 20 cents per foot		8 00
30	"	wainscot for bathroom, at 20 cents per foot		6 00
Prepared material for two pantries				20 00
Prepared material for four closets				8 00
Main stairs				60 00
Attic stairs				15 00
Cellar stairs				4 00
Prepared materials for bathroom				6 00
Mantels				75 00
				$1,607 19

Labor, putting up work	$600 00
Painting	160 00
Mason	750 00
Plumbing and gas	320 00
Heating	195 00
	$3,632 19

A TWELVE HUNDRED DOLLAR DOUBLE HOUSE.

The estimate for this house, in this vicinity, is $1,200—with superior finish, $1,400—but its cost will be less in some other places, where materials are cheaper.

SPECIFICATIONS.

The specifications and drawings are intended to co-operate, so that any work shown on the drawings and not mentioned in the specification, or *vice versa*, is to be executed the same as if mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without extra charge.

The drawings taken in connection with this specification are intended to provide for the completion of the entire carpenter work, mason work, tinning, painting, etc., as well as everything mentioned in the specification.

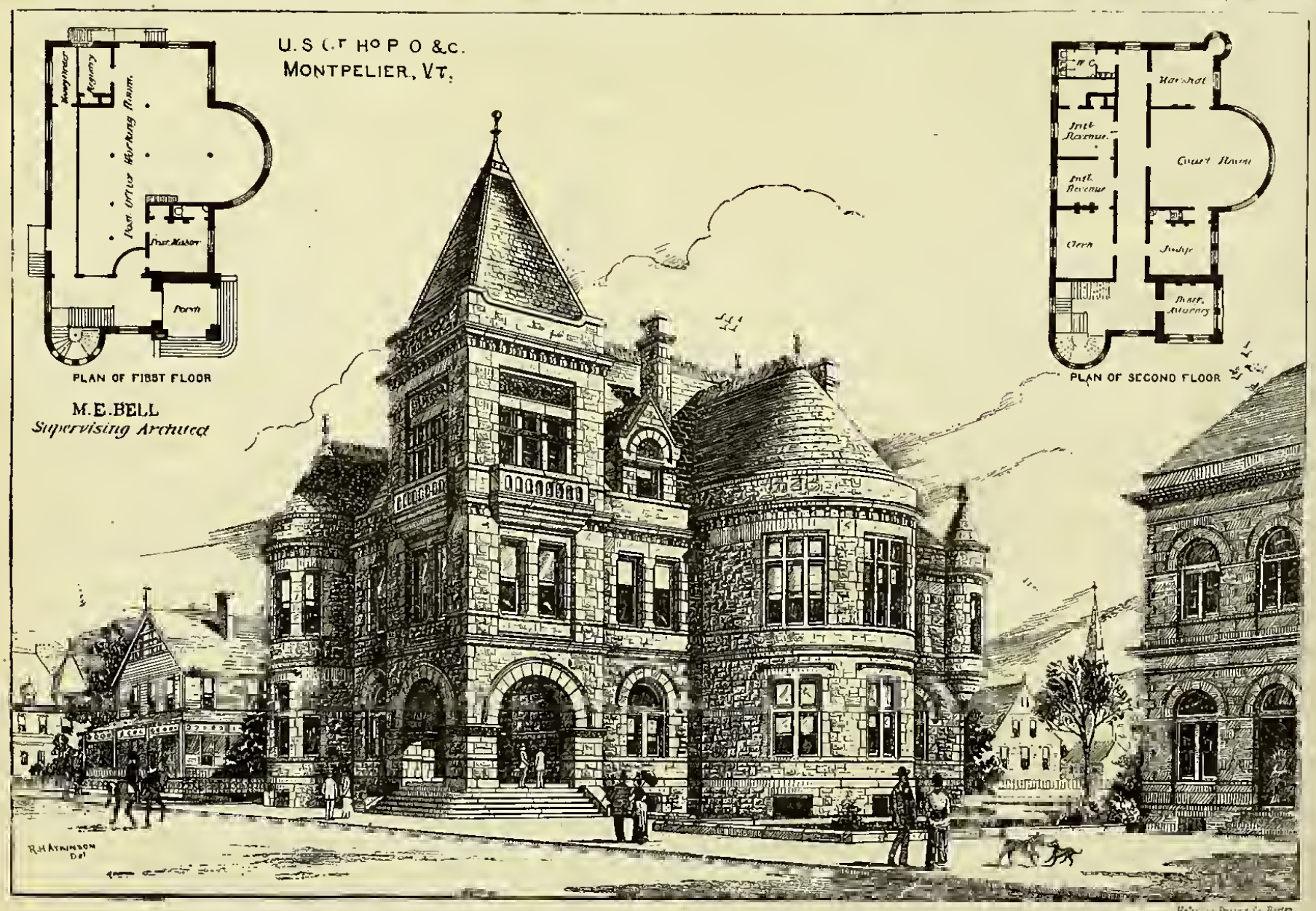
Casings for doors and windows, ⅞"×4"; door jambs, 1¼" thick, rabbeted. The casings to have ½" bead on front edge; all the windows to have neat moulded stools and aprons. All windows to have stop beads, and to be hung on weights and cords. Sash, 1¼" thick; number of lights, etc., as per plan, second quality French sheet glass. All room and front doors to be 1½" thick, all other doors 1¼" thick, and all four paneled, flush moulding. Build the stairs as shown, ⅞ treads, strings, and risers. Put down ash saddles to all doors. The upper flight of stairs to have hand rail; also level rail on second story. Rail, 2×3, moulded; balusters. ⅞×⅞ . newel, 4×4; all of ash. All 1½" doors to have 4" mortise locks; other doors to have 5" rim locks. Put in shelving as shown, ⅞" lumber, all resting on rabbeted cleats. Bedroom closets to have strips under shelves, with wardrobe hooks screwed on same; all windows to have approved window fastenings. Kitchen pantries to be five shelves high. Stoop floors to be ⅞"×4½" white pine; porch ceiling, ⅞×4½ white pine, beaded. Build privy of wide ceiling boards, with seats, door, and a sash complete, with wood box under same, 3' deep.

All the windows, first and second stories, to have outside rolling blinds, hung and fastened complete,

245 ft cornice, per lineal ft		$0 12	$29 40
4 stoops, ready to erect			12 00
4 circles for piazzas			4 00
2,500 ft. flooring, per M		20 00	50 00
4 cellar windows, complete			4 00
14 first story windows, complete, each		5 50	77 00
10 second story windows, complete, ea		5 50	55 00
16 first story doors, complete, each		4 25	68 00
14 second story doors, complete, each		4 25	59 50
Main stairs, complete			25 00
Cellar stairs complete			3 00
400 ft. surhase, per ft		3	12 00
Prepared materials for 2 pantries, 2 washrooms and 8 closets			10 00
Mantel shelves			2 50
Labor for constructing work			250 00
Mason work, complete			423 43
Painting			120 00
Total			$1,400 00

THE COURT HOUSE AND POST OFFICE, MONTPELIER, VT.

We give from the *American Architect* a view of the new Court House and Post Office, Montpelier, Vermont.



THE NEW UNITED STATES COURT HOUSE AND POST OFFICE, MONTPELIER, VERMONT.

MASON'S SPECIFICATION.

Excavation.—Excavate for cellar under rear part of house full width and as marked on cellar plan. The balance to have a trench wall, at least 2' 6" deep below grade. The cellar walls and underpinning to be an 8" brick wall from bottom up, and the cellar to be 6' 3" high in the clear. All to be hard burnt brick. Build the chimneys, as shown on the plans, of hard burnt brick. Plaster the entire two stories, including the closets, with two coat work, skin finish. Furnish and set bluestone sills to all of the cellar windows.

CARPENTER'S SPECIFICATION.

All timber throughout to be pine. The floor beams, 2×8, 16" on centers; rafters, 2×6", 24" on centers; studding, 2"×4", 16" on centers; partitions, 2"×4", 16" on centers; shingles for vertical sides and roof to be 18" pine, laid on 1"×2" shingle lath. The siding to be narrow novelty. Corner boards, 1¼" ×3"; water table, 1½"×5½"; window frames, 1¼"×4"; outside casings; ⅞" jambs; 1¼ main sill; ⅞" subsill; and to have pockets and pulleys; door frames made in the usual way. Outside casings, 1¼"×4", and 1¼" jambs. Stoop treads, 1½"; risers, ⅞"; piazza columns, 5"×5", boxed. Piazza rail, 3"×4"; balusters, 1¼"×2"; outside cellar steps, 2"×10", pine timber. Outside cellar door to be made of wide ceiling boards with battens hung, and have padlock. Form cornice as shown. Gutter and valleys to be lined with tin 14" wide; put up galvanized gutters where shown. Put in furring where required. Floors to be of matched pine boards. Bases, ⅞×5", headed.

when shut or open. The entire house to be sheathed with ship lapped sheathing, well nailed; put tar paper between ship lap and siding.

PAINTING.

Paint the entire house, inside and out, including blinds, chimneys, two coats of good ready mixed paints, of such colors as may be selected. All sap and knots to be shellacked before trimming is done. Putty up all nail holes, etc., complete; paint all tin work two coats of Prince's metallic mineral paint; also paint privy same as house.

BILL OF ESTIMATES.

Lumber.			
50 2"×8"×24'=1,600 sq. ft.			
2 2"×8"×22'= 58 "			
4 4"×4"×16'= 84 "			
28 2"×5"×16'= 373 "			
18 2"×5"×12'= 180 "			
14 2"×5"×20'= 233 "			
13 2"×5"×12'= 130 "			
4 3"×4"×24'= 96 "			
2 3"×4"×22'= 44 "			
200 2"×4"×16'=2,007 "	=4,805 ft. timber, at per M.	$1 40	$67 27
2,000 ft. siding per M		20 00	40 00
14,000 1×8" pine shingles, per M		4 00	56 00
500 1×2 shingle lath and furring, each		4	20 00
130 ft. water table, per lineal ft		3	3 90
200 ft. double corner board, per lin. ft.		4	8 00

M. E. Bell, supervising architect. It is a pleasing design.

THE time which would be taken to discharge 500 gallons of water through a 1½ inch pipe 700 yards long, with a fall of 100 yards from inlet to outlet, is theoretically 16 minutes; but any inequality in the inside of the pipes, or minute obstructions, would increase the time.

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THE NATIONAL AGRICULTURAL EXPOSITION.

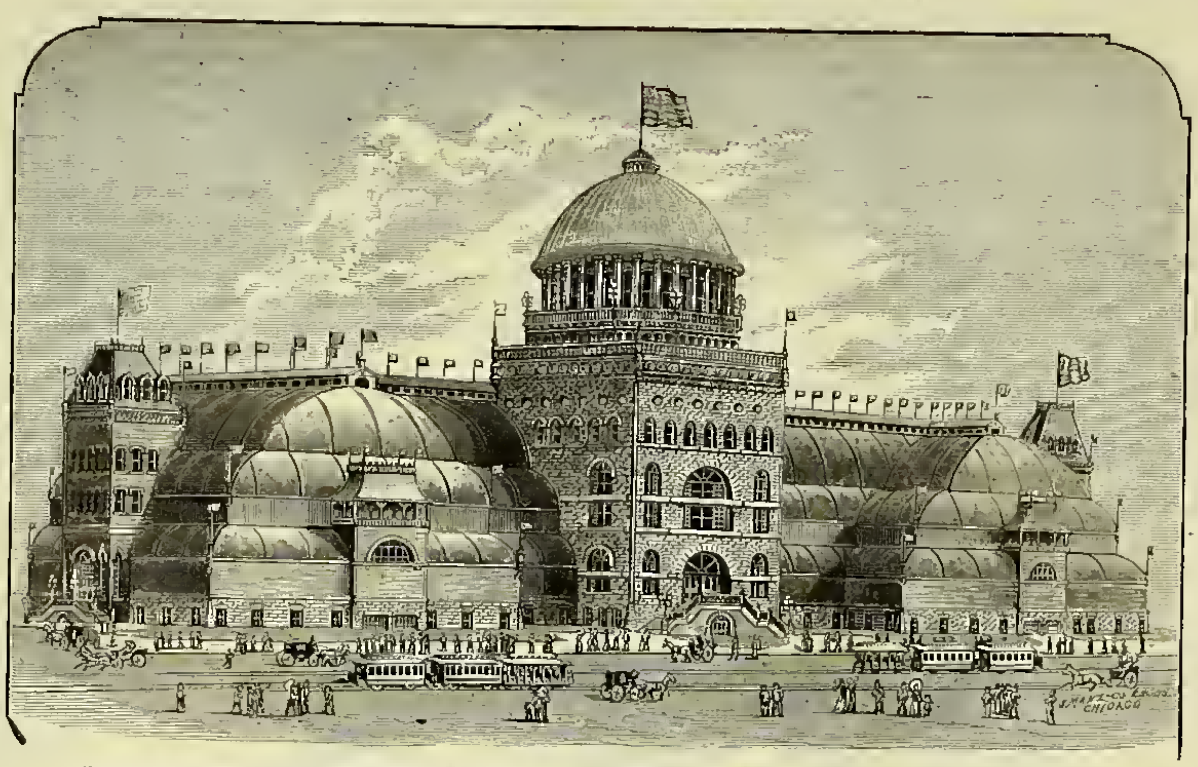
An enterprise has been inaugurated in Kansas City which bids fair to become *the* event of the year in the West. The National Agricultural Exposition is a legitimate outgrowth of the location of Kansas City at the gateway of one of the largest and most productive agricultural areas in the whole country The Missouri Valley has been properly styled "The Egypt of America," on account of its corn-producing proclivity.

The exposition will give great prominence to the products of agriculture, and all the counties of Kansas and Missouri and many Western States will have special pavilions in which their particular products will be displayed at the exposition. The great Western lines of railroad centering at Kansas City have manifested a desire also to have separate exhibits. In addition to these, the mining department will be amply represented in the minerals from Colorado and New Mexico. The machinery department will not be neglected either, but every effort is being put forth to exhibit all the leading articles of American manufacture, and a wide variety of machinery in motion will be displayed in this department. It will be seen, from the picture of the exposition building which is published in this issue, that a really fine exposition structure is being erected for the purposes indicated. It will be constructed of brick, stone, iron, and glass, and will resemble somewhat the old Crystal Palace of London.

The officers of the exposition are: James Goodin, president; Hamilton S. Wicks, vice-president and secretary; John W. Ryckman, manager; and F. J. W. Hart, architect. The building is under contract to be completed September 1, and work is being conducted by day and also at night, by the aid of electric light. The doors of the exposition will be thrown open to the public on September 15, and it will continue thereafter for forty-five days, closing November 1. Kansas City will enjoy quite a carnival season this fall, for, in addition to the exposition, there will be a grand trades parade display, similar to the Veiled Prophets of St. Louis. The exposition grounds are located on the east side of the city, on a beautiful tract of ground, reached by ample street car, cable, and railway accommodations.

The building in which the exhibition will be held is now in process of construction. Its dimensions will be 450 by 255 feet, three floors, with domes, towers, and other elegant appointments. It will have over six acres of floor space for exhibition purposes, and will be constructed of brick, stone, iron, and glass, in a most substantial manner, and at the same time will be a superb architectural ornament. Several commodious annexes will also occupy contiguous positions on the exposition grounds.

These grounds are sufficiently centrally located, yet they have ample room to accommodate all the outside pavilions and agricultural machinery and cattle exhibits that may apply.



THE NATIONAL AGRICULTURAL EXPOSITION BUILDING AT KANSAS CITY.

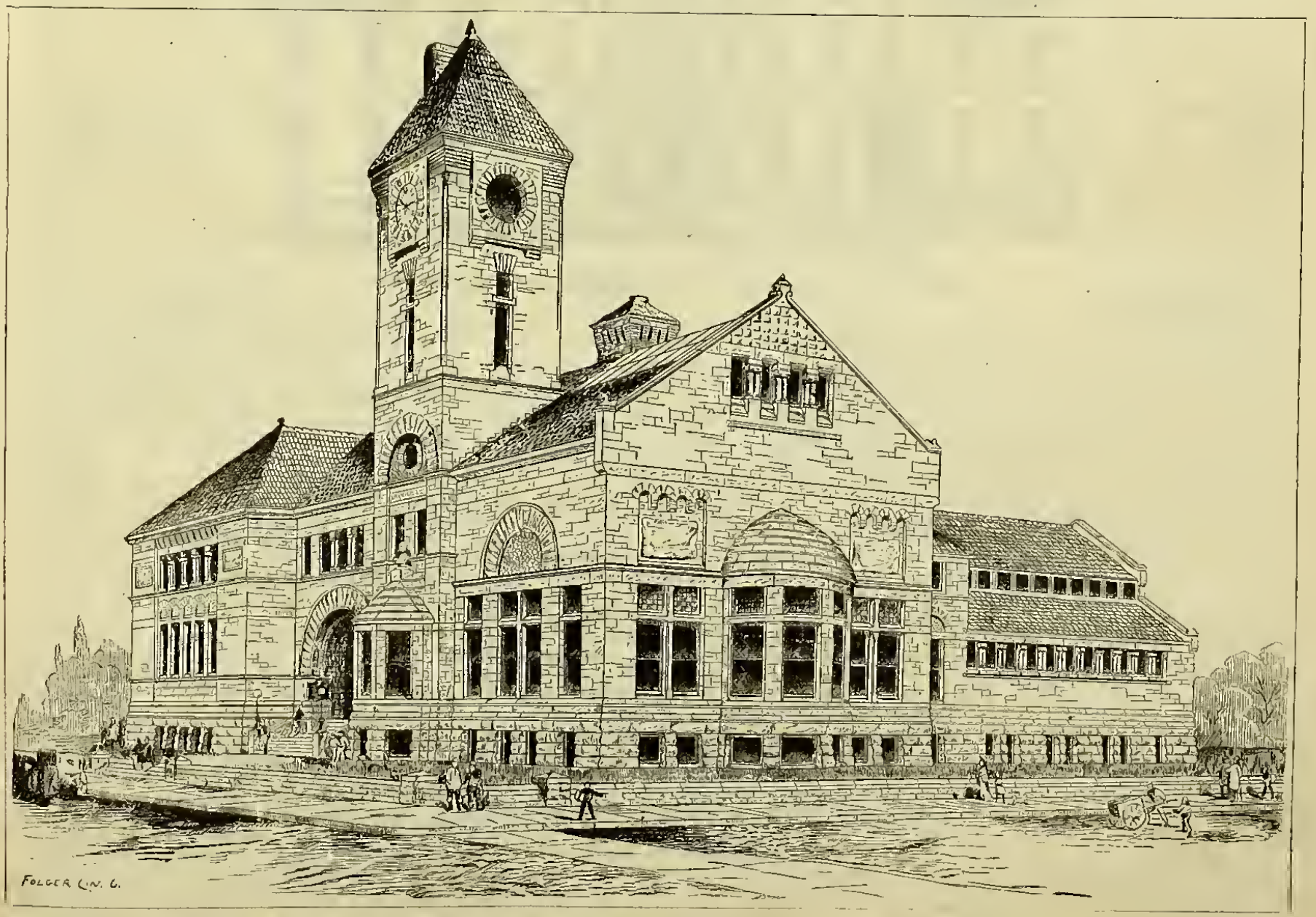
Items for Builders.

Three and a half barrels of lime will do one hundred square yards of plastering, using two coats. Two barrels of lime will do the same amount of plastering with one coat. One and a half bushels of hair will do a hundred square yards of plastering. One and a quarter yards of good sand will do a hundred square yards of plastering. One barrel of lime will lay one thousand bricks. Two barrels of lime will lay one cord of rubble stone. One half barrel of lime will lay one perch of rubble stone. One thousand shingles laid four inches to the weather will cover a hundred square feet of surface, and five pounds of shingle nails will fasten them on. One-fifth more siding and flooring is needed than the number of square feet of surface to be covered, because of the lap in the siding and matching. One thousand laths will cover seventy yards of surface, and eleven pounds of lath nails will nail them on. Eight bushels of good lime, sixteen bushels of sand, and one bushel of hair will make enough good mortar to plaster a hundred square yards. A cord of stone, three bushels of lime, and a cubic yard of sand will lay a hundred cubic feet of wall. Five courses of brick will lay one foot in height of a chimney. Sixteen bricks in a course will make a flue four inches long, and eight bricks in a course will make a flue eight inches wide and sixteen inches long.

THE CARNEGIE FREE LIBRARY, ALLEGHENY CITY, PA.

By the generous gift of Mr. Carnegie, the city of Allegheny is to be provided with a splendid library, and some of our architects have busied themselves in preparing designs for the structure. We present herewith the design of Mr. McLaughlin, for which we are indebted to the *Western Architect and Builder*.

It represents a noble edifice, and is highly creditable to the architect.



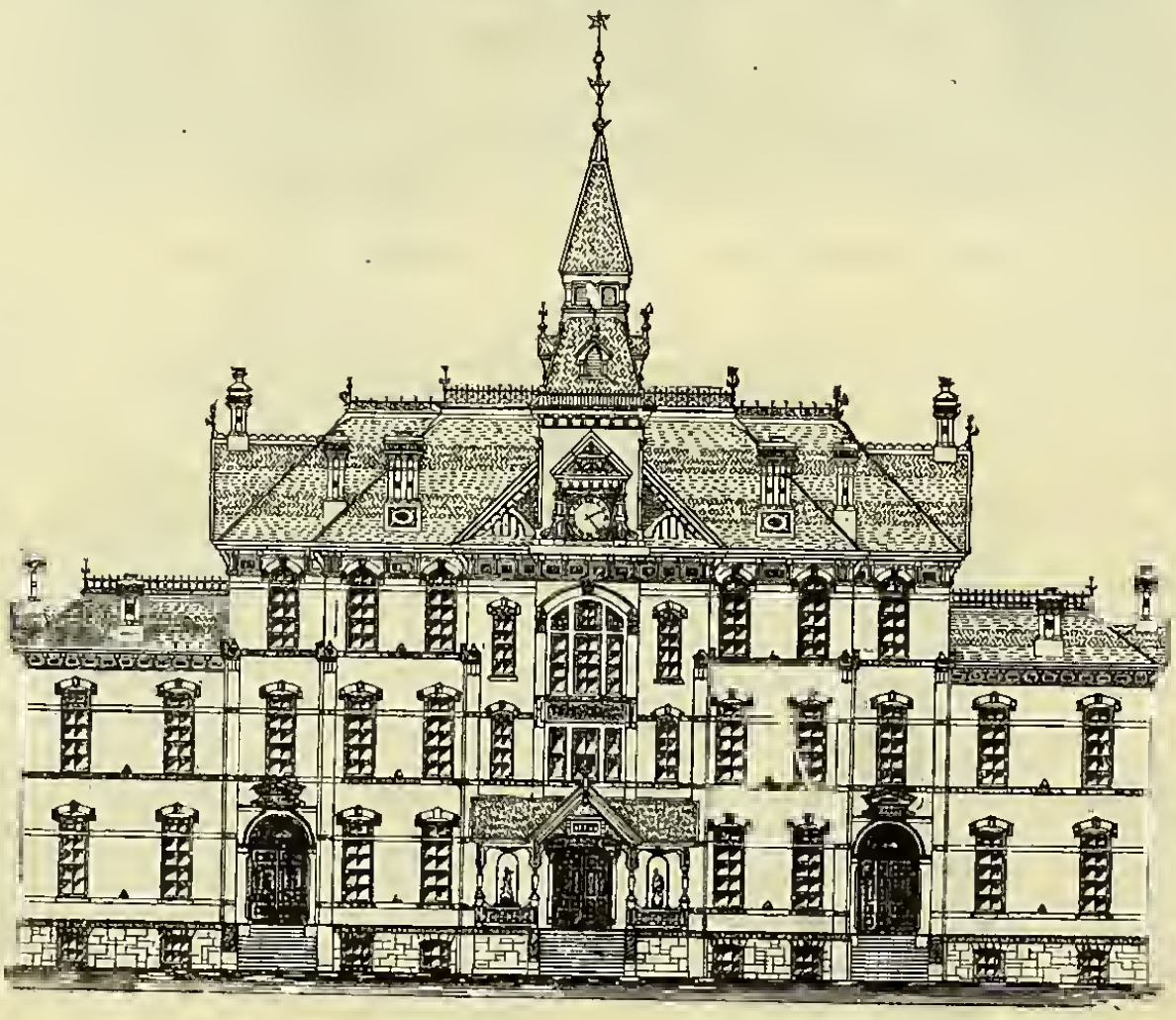
COMPETITIVE DESIGN FOR CARNEGIE FREE LIBRARY, ALLEGHENY CITY, PA.—JAS. W. McLAUGHLIN, ARCH., CINCINNATI, O.

THE COGSWELL POLYTECHNIC COLLEGE.

A few weeks since we chronicled the fact that Dr. Henry D. Cogswell, of this city, had donated property worth $1,000,000 to found a technical school where our boys and girls may prepare themselves for the trades and vocations of life. On this page we give the elevation of the main building of this new institute of learning, the plans of which were drawn by Chas. Geddes, the architect. The structure will be of pressed brick with stone trimmings. It is to be located on the lot corner of Folsom and Twenty-sixth Streets, with a frontage of 245 feet on the first named street and 182 feet on the latter.

The building will be three stories high, and from its imposing and substantial appearance will be the most notable structure in the southwestern portion of the city. It will be 71 feet in width by 85 feet in depth, not including the projections. On each side will be a wing two stories in height, each 35×40 feet. The building will be surmounted with a high roof, covered with ornamental metal Queen Anne shingles, and have handsome cresting on the ridges. In front a high tower rises to the height of 127 feet, the apex topped with a revolving crystal star set in a copper pinnacle. On the face of the tower, above the third story line, will be the dial of a clock, and still lower down will be the name of the school. The main entrance is spacious and surrounded with a wide porch On each side of the door is a niche for the placing of pieces of statuary. There are also two side entrances—one for boys and the other for girls. The main entrance porch is approached by a broad flight of stone steps. The main hallway is 10 feet wide, and opens into a cross hallway 12 feet wide, which crosses the building from end to end. From the cross hall, stairways lead to the second story. Stairs also lead to the stage at the rear and to the front of the assembly hall, in the story above. It will thus be seen that the means of egress are unusually excellent, there being three wide doorways from the ground floor to the street and two from the second story to the assembly hall.

There are to be ten classrooms, each 28×30 feet, four to be on the main floor and the other six to be in the second story. On the first floor, also, will be the offices of the president and secretary, a reception parlor, a library 16×28 feet, and a museum 20×28 feet, besides a number of dressing and toilet rooms. A spacious assembly hall occupies the entire third story. It is 68×70 feet in size and will have a seating capacity for 1,000. It will be used for the delivery of scientific and other lectures in connection with the regular courses of study in the school. This hall is to be handsomely furnished and provided with a stage with all the necessary adjuncts for completeness. All the rooms are well lighted, and every appliance known to modern skill will be introduced to make ventilation perfect. They are to be lighted with electricity, and electric bells and speaking tubes will be run throughout the structure.



THE COGSWELL POLYTECHNIC COLLEGE, SAN FRANCISCO.

A short distance in the rear of the main edifice will be another building, in which the shops and laboratories are to be fitted up. It will face to the north and be 152 feet in length by 40 feet wide, and two stories in height. The ground floor will be devoted exclusively to ironwork, both designing and moulding, having departments for filing, fitting, and chipping. A laboratory will be established in a room 35×40 feet, and fitted with all the essentials for thorough instruction in polishing, fitting, and setting up of various pieces and descriptions of machinery. A machine tool laboratory will be 40×40 feet in size, and completely equipped with iron lathes, a drill press, planers, and rollers, by the aid of which pupils will be instructed in the arts of turning, drilling, and planing iron, so that they will be qualified to construct tools and small pieces of machinery. A forging furnace and laboratory will also be established and occupy a space 40×40 feet. The founding laboratory will be 35×40 feet in size, and contain a furnace and other necessary appliances.

The second floor will be devoted to the chemical, wood, and physical departments. The carpentry department will be 40×35 feet, and be supplied with an extensive assortment of tools. A wood-turning factory will be 40×40 feet, and be supplied with lathes, a planer, a circular saw, a band saw, a mortise machine, a moulder, and several other machines. The remaining space on the floor will be at the disposal of the physical and chemical departments. One room, 20×20 feet in size, will be fitted up with shelving inclosed in a glass front, where all the philosophical apparatus will be kept that is used in experiments in chemistry and physical instruction. The furnaces in connection with this department will be in an adjoining room, 40×50 feet in size.

The department for the instruction of girls will be fully as complete in detail as that for the boys. Here instruction will be given in wood and metal carving, sewing, cutting, and fitting, as well as other mechanical studies. In the basement will be well lighted lunch rooms for the boys and girls; also rooms for the janitors and others who will reside permanently on the premises. There is also some additional space which may be utilized for class rooms or shops that may hereafter be required or found desirable. All the departments of machinery will receive motive power from a seventy-five horse power horizontal engine, which, together with the boilers, will be of the most approved pattern.

In connection with the instruction in the mechanical arts and sciences, a four years' course of instruction will be given to those pupils who may so desire. The course will include a thorough English education, together with German, Spanish, and French. Arithmetic, geometry, and algebra will be embraced in the English course, and special attention given to all branches that may in any manner be deemed essential to the many mechanical pursuits. A course will also be given in mechanical and architectural drawing, embracing both free hand and perspective. Business forms, single and double entry bookkeeping, telegraphy, phonography, commercial law and correspondence, will also receive special attention. A notable feature of the college will be its recognition of the coming education for the preparation of progressive teachers.

The school will be open to the boys and girls of this city and State who may have completed the third grammar grade in the public schools. Tuition will be absolutely free, the endowment of the college being fully provided for by the donation of its generous founder.

The cost of the buildings alone will be some $85,000, and the machinery and tools $25,000 or $30,000 more. The school will be under the personal management of James G. Kennedy, as president, and Mrs. M. E. Arnold, vice-president, who have already been engaged to fill those two important positions. Mr. Kennedy supervised all the plans of the building, and many details were suggested by him. As soon as the construction of the building is fairly under way, Mr. Kennedy will go East and visit institutions of a similar nature, study the methods of work, and ascertain just what will be needed in the shape of machinery and scientific appliances to make the school all that it should be, and all that its generous and thoughtful founder wishes to make it.—*Mining and Scientific Press.*

Roofing Slate.

The roofing slate quarried by E. J. Johnson at his quarry (the "Bangor Central"), situated at Bangor, Pa., has made such a high reputation for its superior qualities that he is compelled to largely increase the output in order to supply the demand for this brand of slate. If parties building will always insist on having "*Bangor Central*" roofing slate, they may rest assured they are securing the best quality of slate in the market.

Any information pertaining to slate roofing will be cheerfully furnished by Mr. Johnson. Prices will be quoted, delivered to any point in the United States.

All correspondence should be addressed to E. J. Johnson, 18 Burling Slip, New York.

A Woodpecker's Sugar Bush.

I have detected one of our yellow bellied woodpeckers, *Picus varius*, tapping a maple tree for the sake of the sap. Attracted to my window by a vigorous hammering, I saw a beautiful male bird sinking a shaft near the base of a large maple. It struck me as being a discouraging place to bore for grubs, as the tree was healthy and the sounds from the tapping gave no evidence of hollowness; so I thought at first it might be a case of misguided instinct, or perhaps merely an experimental bore. As soon as one hole was completed, another was begun, and by the time that was done, the sap had commenced to flow freely from the first. It was then I noticed that it was the sweet sap the fellow was after, and not with the hope of any other reward that the bore was made, for, as the sap flowed, it was sipped up, first from the first hole, and then from the second, and meanwhile, between drinks, the little fellow was vigorously at work upon a third excavation. When this was done, and all three taps flowing profusely, his sweet tongue was not yet sated, but his scarlet head was kept bobbing to and fro, sipping the sap from the three holes, while he energetically started a fourth. This completed, and all four taps well under way, his whole attention was, for a few moments, devoted to his sugar bush, until, at length satisfied, he flew off—possibly to get a pickle!—J. W. Clark, Albany, N. Y.—*Swiss Cross.*

Preservation of Woodwork.

It is said to have been settled by practical and repeated tests that petroleum is an excellent preservative for shingles, lattice work, the timber parts of tools and machinery, and all wood exposed to the weather. A producer and user of petroleum gives as the result of his experience the information that fresh, light petroleum, if applied warm, will penetrate dry wood almost as readily as water, and when it is thoroughly saturated the condition is permanent, water having no effect upon it, as can readily be conceived. He has never found a board or piece of timber about the petroleum works, which he has been running for years, where it came in contact with the oil, that did not remain sound; but where no oil had touched, there were decayed places, and the decomposition was rapid when it had once set in. A wooden storage tank, which was taken apart after eighteen years' service, exposed to all kinds of weather, did not show a rotten spot anywhere, every board being sound. Oil barrels and small tanks have been known to have been covered with a thin layer of earth, in one case for fourteen years, and to have come out sound. Where the sills of barns and similar structures have been saturated with petroleum, they have outlasted any other part of the frame. After the first two or three days it is said the application does not expose the wood to increased risk from fire.—*N. W. Lumberman.*

A Car Load.

An American car load of twenty thousand pounds will contain the following:

70 barrels of salt, 70 of lime, 90 of flour, 70 of whisky, 200 sacks of flour, 6 cords of wood, 15 to 20 head of cattle, 50 to 60 head of hogs, 80 to 100 head of sheep, 6,000 feet of solid boards, 340 bushels of wheat, 400 bushels of corn, 680 bushels of oats, 400 bushels of barley, 360 bushels of flaxseed, 360 of apples, 480 of white potatoes, 1,000 of bran, 130 to 190 of eggs, and 200 kegs of nails.

A FORTY-FIVE HUNDRED DOLLAR DWELLING.

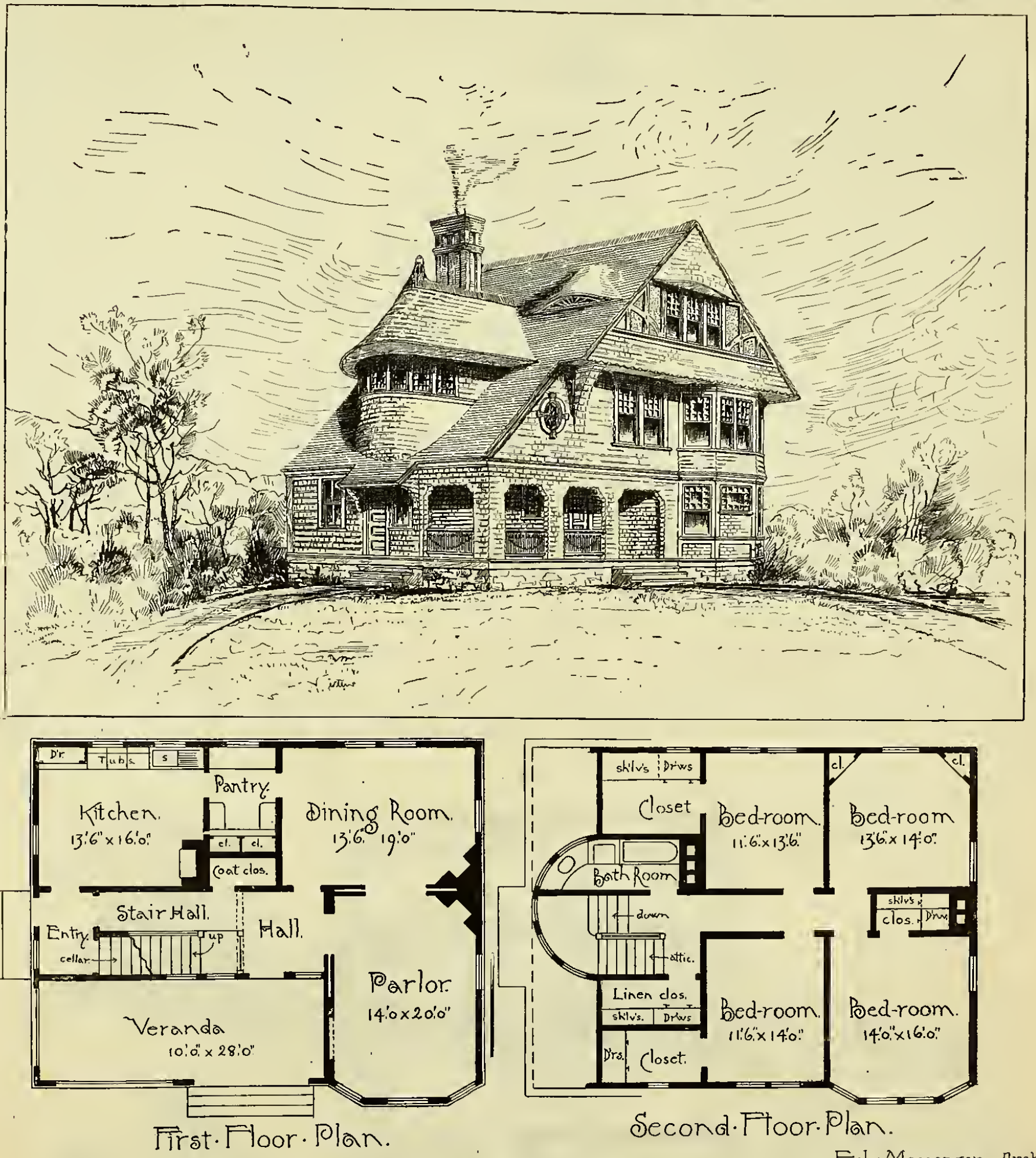
We give the perspective and plans for a house costing about $4,500, designed by E. L. Messenger, architect, Orange Valley, N. J. Is a convenient and comfortable dwelling.

Sand in Plaster.

In Paris the mode of using plaster is to employ it pure and free from mixture. The very low price at which it is sold and the comparatively high price of sand dispense with the motives of economy which render mixtures almost indispensable in our case. While the practice in France is to use plaster pure, I am disposed to think that the mixture of sand, so far from being prejudicial, is even desirable, if confined within reasonable limits. We find that in reassuming the state of hydrated sulphate of lime the plaster goes through an imperfect crystallization, and this action is accompanied by a singular rearrangement of the molecules. This causes the plaster to swell when used alone, and to such an extent that it is impossible even to finish a ceiling close up to a wall at once. Now, the introduction of a body so full of inequalities as the coarse, sharp sands must afford room for the free action of this expansion, and, at the same time, the facets of the sand must offer, as it were, nuclei which cannot but be favorable to the crystallization. It is, doubtless, on these principles that we can explain the superiority of the plaster containing wood breeze, which does become harder than the purer plasters if used alone. Too large a proportion of sand should be avoided; but very fair work can be executed even with a mixture in the proportions of two of sand and one of plaster. Under any circumstances the finishing coat should be pure. Subsequent experience will decide whether the use of two materials of this kind does not expose the work to unequal contractions, likely to cause fissures or cracks.—*G. R. Burnell.*

One Safe Theater.

The new Flemish theater in Brussels will afford every guarantee of safety which the most timid playgoer could desire. The materials employed in its construction are stone and iron; and, though it will be impossible to dispense with woodwork altogether on the stage, all the timber used will first be rendered absolutely incombustible. Two broad flights of stairs, one at each side of the main entrance, lead to the grand circle and the *foyer*, which are on the first floor. The three upper tiers have each its own independent stair way opening directly on the street. The building is provided with twelve different outlets—nine for the egress of the spectators and three for that of the *personnel*. But the most original feature in the construction is the system of external balconies or outer galleries, corresponding to those in the interior of the building, with which they communicate by no fewer than a hundred different doors—twenty-five to each tier. These balconies are further connected with each other by iron stairs of good width and easy descent, and the lowest of the four is capacious enough to give standing room to the entire audience.—*St. James' Gazette.*



A FORTY-FIVE HUNDRED DOLLAR DWELLING.

MESSRS. MUNN & CO., SCIENTIFIC AMERICAN office, 361 Broadway, N. Y., are assisted by able architects in the preparation of plans and specifications for all descriptions of buildings. Terms very moderate. We aim to make our estimates accurate and our plans complete, so that when placed in the builder's hands no difficulty is experienced in the construction. Our work goes to all parts of the country, and gives very general satisfaction. We shall be pleased to hear from those who contemplate building.

AN ENGLISH DOUBLE HOUSE.

We give, from the *Building News*, illustrations of an English double house of the cottage style, and moderate cost. The estimate for construction here is $3,000 in stone and $2,200 in wood.

How to Increase Your Wages.

Every thinker knows that the man who would succeed must do more work than he gets paid for, in every profession and trade. We take it for granted that the man who will do only twenty dollars' worth of work a week because his salary is but twenty dollars will never get more than twenty dollars a week, for the simple reason that he has never shown his employer that he is worth more. We figure it that an employe who means to succeed has to do from ten to twenty per cent more work than he gets actual pay for. This he has to do until he reaches a certain point, and having reached that point, he will find that by as much as his income has increased by so much has the demand for amount and intensity of his labor diminished. To put this theory into figures, we will say that a boy receiving three dollars a week should do four dollars' worth of work; the boy receiving five dollars a week should do seven dollars' worth of work; when he gets to be a man and receives twenty dollars a week, he should do thirty dollars' worth of work; a man receiving thirty dollars should do forty dollars' worth of work, and so on until, say, the salary reaches seventy-five dollars, and then the laborer can give himself somewhat of a rest—that is to say, about fifty dollars' worth of work will satisfy his employer. Labor brings its market value, and is seldom overpaid, oftener underpaid. It is the experience, the "know how," that brings the money.—*Philadelphia Ledger.*

Good Water Promotes Good Health.

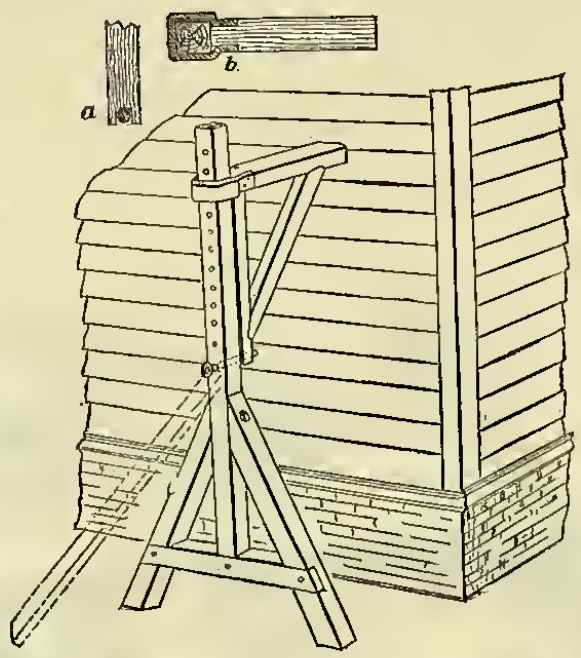
Hoboken formerly shared the water supply of Jersey City, but in 1882 changed to an independent supply drawn from the Hackensack River at New Milford. For the seven years (1875-81) previous to this change, the total average death rate of Hoboken was 26·9 per 1,000, against 23·5 for Jersey City, or a comparative excess of 3·4 per 1,000—a result which might be expected, other things being equal, since the site of Hoboken is naturally more unhealthy than that of Jersey City. But for the five years (1882-86) following the change of water supply, the death rate of Hoboken was but 22·6, against 22·9 for Jersey City, a gain upon Jersey City's rate of 0·3 per 1,000, or a total change and saving to Hoboken of 4·3 lives per 1,000 annually. Further, the average rate per 1,000 per year for the first quarter of 1887 is, Hoboken 20 deaths, Jersey City 22·73 deaths per 1,000; while the April report of the Hudson County health board gives death rates as follows: Jersey City 22·6, Hoboken 18·9 per 1,000. In other words, Jersey City's annual death rate under the use of Passaic water has remained practically steady at about 23 per 1,000 for the past twelve years, while Hoboken's rate has been steadily decreasing since purer water has been introduced, having fallen from a long annual average of 26·9 to an actual return at the rate of 18·9 for a single month, or a difference of 8 lives per 1,000 per year—a decrease of 30 per cent.—*Fire and Water.*

A PORTABLE SCAFFOLDING.

To the Editor of the Scientific American:

I send you a sketch of a portable scaffolding I use in my work in suburban building. I find it convenient and saving of considerable lumber and time in effecting changes, which can be done by two men around the whole of a building in half an hour, and this without splitting lumber or using nails.

The sketch will indicate the general construction of



the scaffold, which consists of the main upright standard, about 3 in. by 4 in., and of any desired length, supported on the two legs, spreading some 6 feet, and strengthened by the horizontal brace, the parts being bolted together or connected in some other convenient manner. The bracket is formed of 2"×3" and 2"×2" stuff and is from 3½ to 4½ feet long on the upper arm. To this arm is attached an iron yoke (as shown at *b* in the sketch), which slides up and down the standard. The bracket is supported on a one-half inch iron pin, passing through holes in the standard, the end of the upright being slotted as shown at *b*.

As a rule, I use 1½ in. planks for scaffold boards, placed upon the horizontal arm of the bracket. The scaffold is supported by leaning against the building, the weigh on the boards throwing it in that direction, while the spreading legs entirely prevent it falling sideways. If it should be thought necessary in any particular case, a strut might be placed at the back, as shown by dotted lines, to prevent its falling in that direction, but this is rarely required.

When it is desired to alter the position of the scaffold, it is not necessary to remove the boards. One man takes a pole, and placing it beneath the bracket, raises it sufficiently to clear the pin, while another man takes the pin out and places it in a higher or lower position in the standard as may be required.

This scaffold can be used for any description of building, and effects a considerable saving.

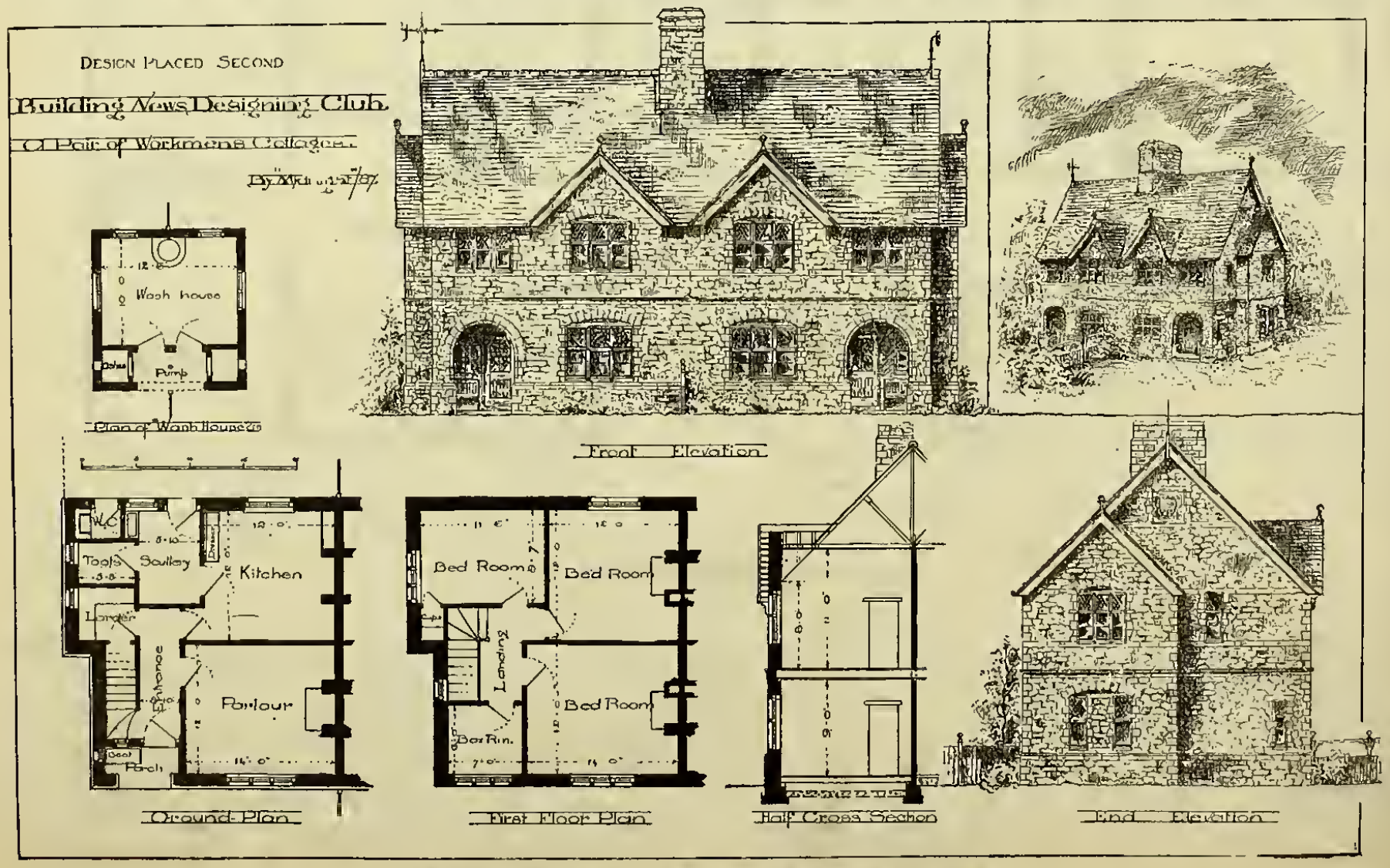
C. J. Dietrich.

La Grange, Ill.

A New York House.

The Marquand house is situated in Madison Avenue, and, as the name implies, is the residence of Mr. H. G. Marquand. Externally the house may be described as French Renaissance in character, though in detail this style is not adhered to. It is quiet and unpretentious in general effect, the lower part being of warm-colored sandstone, while the upper portion is built of red brick with stone dressings, and the roof covered with green slates. The main entrance is at the side, with outside steps leading to open porch, the ceiling of which is formed of richly colored old tiles from Spain, set in panels. The door opens into an ante-hall, which has a high dado of dark color, with a deep frieze of gold forming the background for figure decoration. It contains upholstered seats, and from it are two wide doorways, one leading to the guest stairs, the other to the hall. These guest stairs give access to retiring rooms, which are in close proximity to the first gallery of the hall and the main staircase. The larger hall, which may be called Renaissance in design, is the full height of house, and lighted from roof, with staircase of light oak, having richly carved notch board, and at each floor level a gallery with open balustrade. On the walls of part of the lower portion are panels of fine old Moresque tiles, with the intervening spaces covered with old Spanish leather. Valuable old English and other tapestries cover portions of the wall space, and on the higher landings large pictures are hung. For the furnishing of the hall old English carved oak has been used, a finely carved center table from Chester being a prominent feature. In the fireplace is a large dog grate, and in the spandrel of the first flight of stairs is small fernery and miniature waterfall and fountain.

At the right hand side of hall is the entrance to the salon, which is designed and carried out on the basis of the Greek style. It is an oblong apartment, with the door in the center of the long side, windows at one end, and the fireplace at the other. Opposite the entrance is a recess, divided from room by marble pillars, and through glazed openings behind may be seen a small conservatory filled with flowering plants and ferns. Round the room is a low dado of polished, warm-colored marble, formed in panels. The architraves and linings to recesses of windows are of warm, yellow-toned marble, moulded and carved, and round the whole room a sculptured statuary marble frieze extends, which was executed in Rome by eminent Ital-



AN ENGLISH DOUBLE COTTAGE OF MODERATE COST.

ian sculptors. The walls are hung with silvery gray silk, forming the background to many valuable pictures, including works by Rembrandt and other old masters, together with works by Alma Tadema, R.A., including his "Reading of Homer." In the center of ceiling is large panel, with beautiful figures on a gold ground, painted by Sir Frederic Leighton, P.R A. This formed his most important contribution to the exhibition of the Royal Academy last year. Round it, as the center, is paneling of cedar wood, oiled, so as to be of dark tone. The open fireplace has a marble mantel the full height of the room, with classic busts in the panels of the upper part, and on the parquet floor are fine skins.

The exquisite furniture for this salon was made in England, being designed by Alma Tadema to harmonize with the general style of the room. It is all very elaborate and distinctively Greek in form, with the framing generally of ebony, beautifully inlaid with carved ivories and mother-of-pearl and boxwood; the mouldings and carvings are particularly refined and delicate. The long settees and chairs have coverings of silvery gray silk, embroidered with patterns which are reproductions of classic examples.

The grand piano is similarly made and inlaid, and the music cabinet is a magnificent piece of furniture. There are two tripod tables, with Algerian onyx tops of great beauty.

The conservatory, which leads from the salon, is filled with ferns and flowering plants, arranged on ornamental rockwork, over which run streamlets with miniature pools and waterfalls, all very effectively lighted in the evening by electric lights. The windows are elaborately painted with Renaissance designs, so as to obscure the view from the avenue.

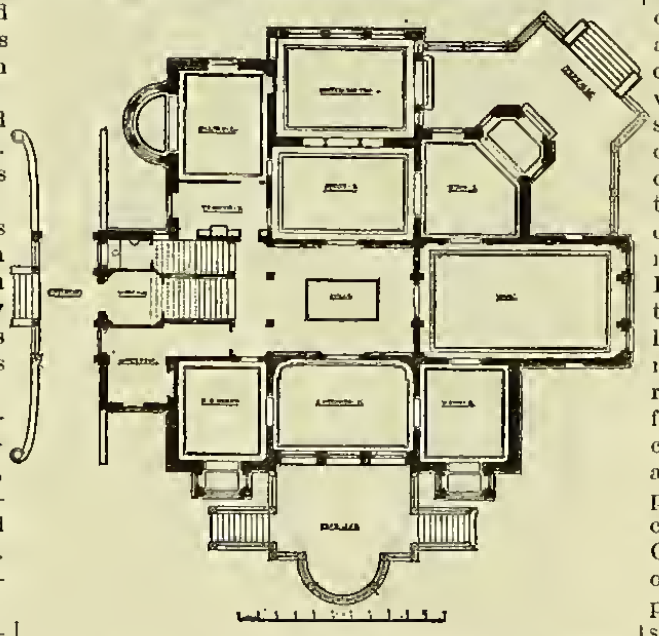
A small withdrawing room from the salon is a wondrously beautiful example *a la* Alhambra. The mantelpiece is of delicately colored marble, richly carved, and the walls, greatly enriched in low relief, are decorated in cream and gold, with frieze and ceiling of old Moresque tiles of magnificent color, set in panels. Some pieces of low-toned, but gorgeous, lusterware pottery aid the chaste and rich effect of the room.

Again entering the hall, a large doorway on the opposite side to the salon entrance leads to the parlor, which is bewilderiug in its richness and lavish profusion. Here the style chosen is Japanese of a very pronounced type, and carried out with close attention to detail. It is a perfect marvel of ingenuity and quaint conceits, magnificently carried out. Mr. Marquand has for many years been an ardent collector of Japanese curios, old carved ivories, wondrous specimens of lacquer work, embroideries, pottery, etc., and these have been incorporated in the design. The room is oblong, with bay window at one end and fireplace in semi-recess at other.

The walls at side for about seven feet high have continuous open cabinets made of "quebrache wood," from Brazil. This wood, when polished, is of a dull terra cotta red color, and is one of the very hardest obtainable. There is great difficulty in working it, but this has not been taken into consideration in the design, which is crowded to the utmost with elaborate detail—cut and carved and moulded with infinite variety. Recesses of various sizes are formed, panels of lacquer work being let in the backs. In these recesses are placed rich and rare Japanese and Chinese pottery, mostly vases of beautiful and curious forms, and of rich self-colors—turquoise and celadon perhaps prevailing.

The fireplace in recess at end is a wonderful piece of design and a marvel of work. It almost defies description, and it must suffice to say that it would be utterly impossible to elaborate it further than it is at present. Some splendid old Japanese bronzes have been incorporated in the design with excellent effect. At the side is a richly stained glass window, painted in strong and vigorous colors by La Farge, and illuminated from behind by the electric light.

Round the room is deep frieze of specially manufactured silk, which was embroidered in Japan. The ceiling is of paneled wood. Richly embroidered silks of beautiful and delicate colors are used as hangings, and in the furniture the Japanese feeling has been carried out; but comfort has not been sacrificed. Altogether the room is quite unique, and at every turn there is an astonishing amount of variety and interest.



En suite with this gorgeous parlor is the dining room, which has been designed and decorated after the manner of the Elizabethan houses in England. The room is wainscoted, and in the large, open fireplace is old fashioned dog grate. The furniture is all in the same style, darkened oak being used throughout, and to insure accuracy of form and detail the whole of the appointments were sent from England, special care having been taken to follow old examples in the designs.

Service to the dining room is from the butler's pantry adjoining it, as is usual in almost all American houses. Here the fittings are of polished mahogany, while all the conveniences for working are of the most complete description. The kitchens, etc, are in the sub-basement, and are fit adjuncts to the house, marble being freely used and the walls tiled.

On the first floor and throughout the house the same lavish profusion reigns. The library and boudoir, though not quite so striking as the apartments already described, are richly decorated and splendidly appointed. The principal sleeping apartments are very elaborate, with beautifully finished dressing and bath rooms adjoining. Each of these suites of rooms is finished in a different style, as much care having been exercised in them as in the reception rooms. They are fitted and finished in various kinds of wood, the walls hung, in many cases, with old and costly silks, or richly decorated by well known American artists. On the walls of the rooms and corridor are valuable etchings and engravings, besides many water colors from English exhibitions. The numerous fixed wardrobes or clothes closets are fitted up with cedar wood.

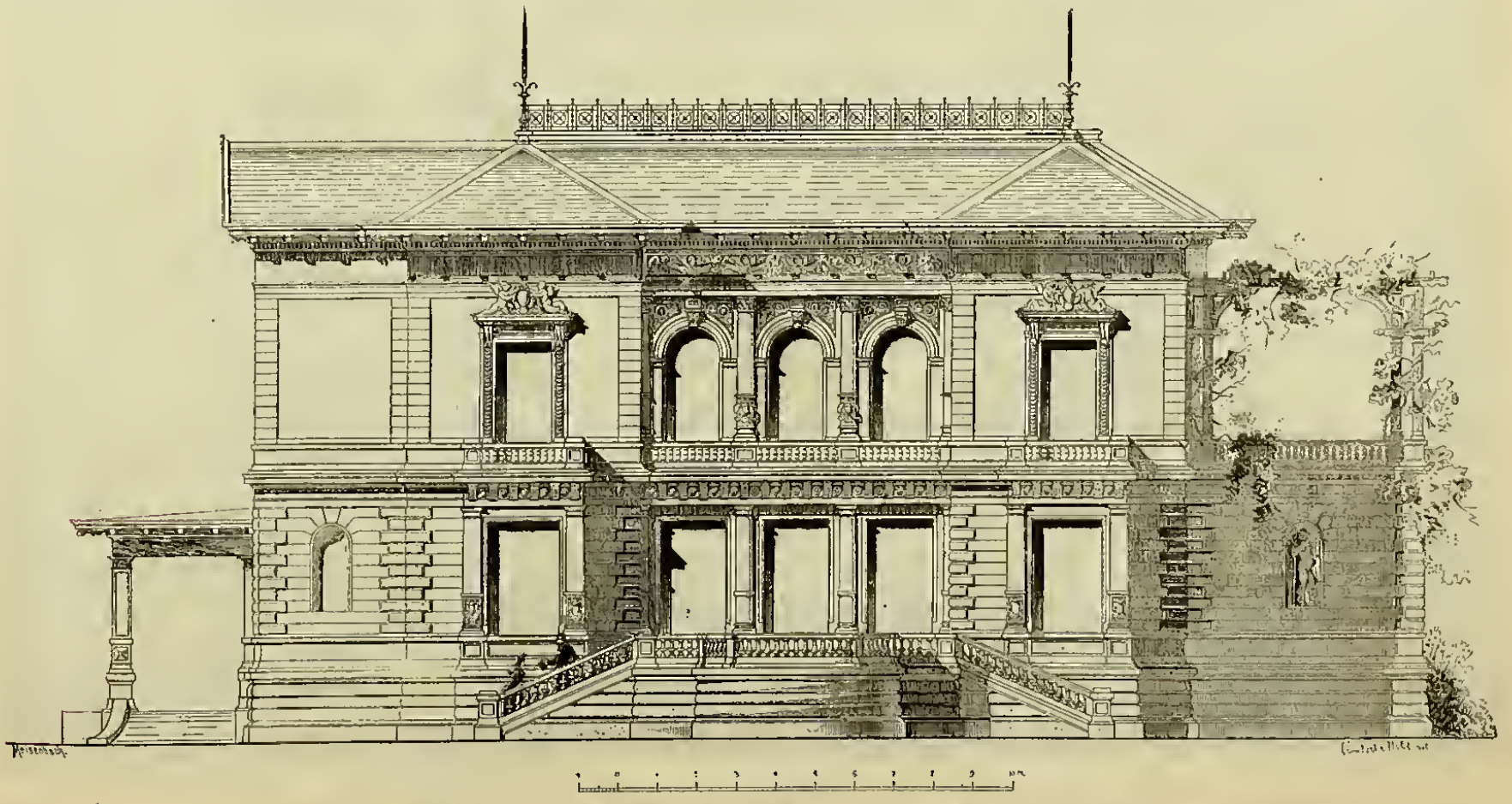
Mr. R. M. Hunt, of New York, was the architect of the Marquand house.—*John B. Gass, A.R.I.B.A., Building News.*

Etruscan Tombs.

Etruscan sepulchral chambers resemble very closely the early crypts, by which they probably may have been suggested. Like the tombs of the Greeks, they were always below-ground. In fact, where this was difficult to accomplish from the flatness of the country, a circular apartment was built, and the earth piled over it so as to completely cover it. The Greek tomb was generally a sort of chamber to inclose the body, sometimes a mere stone coffin, sometimes very like our own family vaults, but without the arch. The Etruscan tomb, on the contrary, was the banqueting hall of the departed spirits. Hewn out of the solid rock, the ceiling was nevertheless carved to resemble the timber rafters of a chamber, the walls paneled like wainscot. Benches, armchairs, footstools, tables, all hewn from the solid rock, fill the chambers, while the walls are hung with weapons and tripods, lamps and other utensils lie about, and the panels are filled with pictorial representations and stucco figures. There is, in fact, little doubt that the Etruscan subterranean chamber was a complete copy, in design, decoration, and arrangement, of an Etruscan dwelling house. A plan and interior view of the famous tomb at Turquinii, commonly called that of the Cardinal, is given by Canina. The plan is that of a square chamber, cut out of the solid rock, the ceiling or roof of which is supported by four solid piers, strongly resembling that of some of the early mediæval crypts.—*A. Ashpitel.*

A CONTINENTAL COTTAGE.

Our engraving shows the Helbing Villa, in Wandsbeck, built by Puttfarcken and Janda, architects, of Hamburg. Built in 1885. In the basement are the kitchen, storerooms, etc. On the first floor are the living and drawing rooms, dining room, etc., and the upper story contains only sleeping rooms. The owners gave positive directions for the arrangement of the plans, according to which seven rooms of the first floor were to be connected, in consequence of which the entrance and the vestibule had to be included in one room. The building is finished in cement and has a wooden roof. The interior is finished in the richest manner; the hall being completed in stucco, and the dining room, billiard room, and gentlemen's rooms are provided with wooden panels and wooden ceilings. The ceilings of the other rooms are plastered and richly frescoed. All the furniture and decorations were made from plans drawn by the architects. The cost of the building is about $40,000, and of the furniture about $20,000.—*Architektonische Rundschau.*



A CONTINENTAL COTTAGE—PUTTFARCKEN & JANDA, ARCHITECTS.

FLOORS AND CEILINGS: ANCIENT AND MODERN.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

(*Continued from page* 136.)

IV.—THE FLOOR COVERINGS OF JAPAN.

Japanese house mats, *tatami*, are as neat, refined, and soft a covering for the floor as the finest Axminster carpet. Miss Bird gives their dimensions as 5 ft. 9 in long by 3 ft. broad and 2½ in. thick. The dimensions generally given are 6 ft. long by 3 ft. broad. The frame is solidly made of coarse straw, matted and bound together, and this is covered with very fine woven matting, as nearly white as possible, and each mat is usually bound with dark blue cloth. Professor Morse says the edges are trimmed true and square, and the two longer sides are bordered on the upper surface and edge with a strip of black linen an inch or more in width. The surface of these mats in rooms, and mattings of the best quality in general, are made of the *Juncus effusus* (the pith of which is used for candles and lamp wicks in the province of Ooui), of the *Isolepis* in Bingo, and of the *Cyperus rotundus* in Satsuma and Bingo.

Fig. 6.—A CARD PARTY.

For the common mattings, rice straw and also different kinds of rushes are used. For the benefit of botanical readers, we append their names: *Scirpus lacustris*, *L. hydropirium latifolium Griseb.*, and *typha*. These plants grow almost everywhere. Temples and rooms are measured by the number of mats they contain, and rooms must be built for the mats, as they are never cut to fit the rooms. They are always level with the polished grooves or ledges which surround the floor. They are soft and elastic, and the finer qualities are exceedingly beautiful. They are as expensive as the best Brussels carpet, and the Japanese take great pride in them. One of the drawbacks connected with this very thickness, which accounts somewhat for their softness, is the place of refuge which they offer to myriads of fleas.

The Japanese architect invariably plans his rooms to contain a given number of mats. According to Professor Morse, the rooms are planned to contain mats in the following numbers: two, three, four and one-half, six, eight, ten, twelve, fourteen, sixteen, etc. In the two-mat room, the mats are laid side by side. In the three-mat room, the mats may be laid side by side, or two mats one way and the third mat crosswise at the end. In the four and one-half mat room, the mats are laid with the half mat in one corner. The six and eight mat rooms are the most common sized rooms. This will serve to indicate the Japanese fondness for littleness. In the illustration of a design for a twelve-mat room, if the two mats at the right and left hand ends be omitted, the remaining mats will be properly arranged for an eight-mat room, or twelve by twelve feet.

The six-mat room would be nine by twelve feet. In adjusting mats to the floor, the corners of four mats are never allowed to come together, but are arranged so that the corners of two mats abut against the side of a third. They are supposed to be arranged in the direction of a closely wound spiral.

In the houses of nobles, says Professor Morse, the border strip of black linen has figures worked upon its face in black and white. The mats fit tightly. The floor upon which they rest is generally made of rough boards, with open joints. As you step, the mat yields slightly to the pressure of your foot. Old mats become slightly uneven and hard from usage. Shoes are invariably left at the door or entrance to the house, as it is considered a mark of great impropriety to wear shoes in a house. The hard heel of a boot or shoe not only leaves indentations on the upper surface of these soft mats, but it crushes and breaks the straw body of the mats, and would rapidly ruin them. Upon these mats the people eat, sleep, and die. They represent the bed, chair, lounge, and sometimes table, combined. In resting upon them, the Japanese assumes a kneeling position. A very good view of this position is shown in our illustration, Fig. 6, "A Card Party," where a profile of the figure in the foreground represents it admirably. The legs are doubled up at the knee, the haunches resting upon the calves of the legs and the inner sides of the heels, the toes being turned in so that the upper and outer part of the instep bears directly on the mats. It is only with a great deal of practice that a foreigner can become accustomed to this position. In this attitude they receive their friends at ceremonious repasts, as shown in our drawing, Fig. 7, which is a *cha-no-yu*, or tea party, showing all the participants in the kneeling position alluded to. The little black boxes in the illustration are the *hibachi*, made of wood, and contain a small earthen vessel for holding hot coals. In the making of the tea the utensils are used in a most precise and formal manner. The tea ceremonies have had a profound influence on many Japanese arts. Professor Morse has given us a very interesting description of the ceremonious etiquette observed in conducting them. In the study of a design for a twelve-mat room, which we show in Fig. 8, the illustration indicates merely the geometric design. The outside border of mats, six in number, are composed of a fine light orange colored straw, bound on the long edges by a deep blue band of cloth an inch wide. The basket work mats at either side of the center piece are in light dove color, of the same general tone as the border mats. The dark squares noticeable near the corners are plaited in with a decided dark gray straw. In the two center mats, which are so designed as to appear like one mat instead of two, the four deeply outlined small squares are woven separately of old turkey blue colored straws, lined with bands of bright yellow finely plaited straws. The border line of the two center mats is interplaited, as indicated in the design, with black and orange colored straws, the intervening space consisting of two rows all around, excepting where intereepted by the four little squares, and adjoining the border just described, is plaited in a dark dove colored straw. The large square, which is apparently in the center of the two central mats, is arranged into two patterns, diagonally, as indicated in the design. The upper right hand diagonal half is in black and yellow straws,

Fig. 7.—A CEREMONIOUS TEA PARTY.

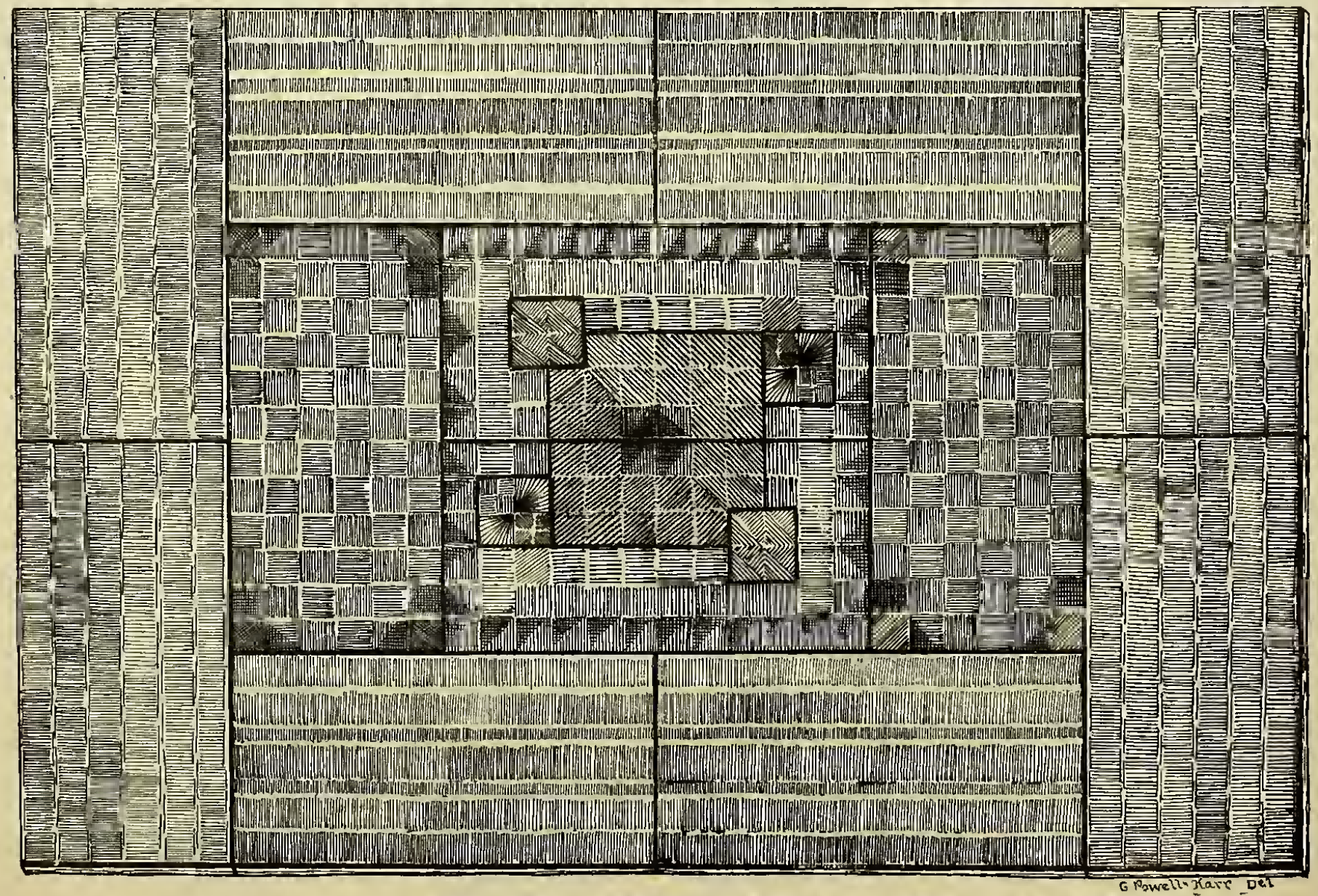


Fig. 8.—STUDY OF A DESIGN FOR A TWELVE-MAT ROOM.—BY C. POWELL KARR, ARCH.

alternately arranged, and the lower left half is in blue and yellow plaitings, and in the center square of all on the upper side, yellow pierces the black half diamond by interplaiting, and on the lower half blue pierces yellow, the shaded quarter points being yellow.

The size of room corresponding to this number of mats is 18 ft. by 12 ft. In the above design, the high lights are struck in the orange and yellows, the shadows in the black and grays, and the harmonizing tones in the dove shades.

In Japan a good quality of mats can be made for one dollar and a half apiece, though they sometimes cost three or four dollars, and even a higher price for a special design. The poorest mats will sell from sixty to eighty cents each. No description can do justice to the beauty of the plaiting, the dexterous workmanship, the luxurious yielding to the foot as it presses onward in a stride, for our impressions of a mat are derived from the coarse Chinese mattings, with which all of us are more or less familiar. To name the two types of mattings in the same breath is to vulgarize the one and refine the other.

The floors of most rooms are permanently covered with mats, and, as a consequence, the material is of rough boards, and laid without consideration as to regularity. In this way very poor lumber is used, and wide spaces between the boards are not inadmissible. In halls or vestibules the floor is composed of wide planks and the surfaces are polished and glassy, and kept so with remarkable skill. Polished wood floors in portions of front rooms are quite common in country houses and in many instances reflections of surrounding objects may be seen mirrored in their burnished faces. In country inns, the floor in the forward part of the house is sometimes laid with plank. In merchants' houses, bordering the street, the matted floor, according to Professor Morse, properly terminates a few feet within the sill, the space between being of earth. The floor being raised, the space between the edge of the floor and the earth is generally filled with plain panels of wood, though sometimes designs of flowers or conventional figures are cut in the panels. The kitchens, in every case, have wood floors, as do the halls, verandas, and all passageways. The ground beneath the floor is, in the houses of the better class, prepared with gravel and mortar mixed with clay, or macadamized.

APPARATUS FOR TESTING LIME AND CEMENTS.

The apparatus herewith figured permits of rigorously establishing the relations that exist between the progress of solidification of hydraulic products and the different phases of their manufacture. It permits likewise of comparing the products with each other as regards initial energy, and that too at every instant for several days. Finally, by means of this little instrument, it is possible to establish certain relations between the initial behavior of a product and its ultimate resistance.

The figure represents the apparatus reduced one-half. The device consists of a hollow rod weighing an ounce and a half, which slides without friction in a tube provided at the base with a disk 1¼ inch in diameter. The tube is provided at the side with an adjusting screw that prevents the rod from sliding. The rod is terminated beneath by a steel needle of 0·04 inch section and one inch in length. Besides this, it is provided above with a shoulder that permits of its weight being progressively increased by placing on it disks of zinc, each weighing an ounce and a half.

If the apparatus be placed upon a plane, hard, horizontal surface, and the screw be slowly and progressively loosened, the extremity of the needle will come into contact with the plane surface, and the zero of the vernier will coincide with that of the divisions in millimeters of the rod.

The face of the rod that touches the extremity of the screw is inclined upon the longitudinal axis in such a way that the descent is always slow and progressive in measure as the screw is loosened.

The apparatus is used as follows: The soft paste is put into a mould, and made to assume the form of the latter. At the moment the test is to be made, the hardened pasto is removed from the mould and placed in a convenient position for operating. The zeros coinciding, and the needle being unloaded, the apparatus is placed upon the hardened paste, and held thereon by slightly pressing the disk with the thumb and forefinger of the left hand, placed each side of the tube. The screw is gradually loosened, and the reading n is made. Then the screw is tightened, and, without moving the left hand, the needle is loaded with m disks with the right hand. Then the screw is slowly loosened, and the reading N is made. $N - n$ will be the depth of penetration at 50 m grammes (1¾ m ounce), and 5 $(m + 1)$ the pressure due to the needle per square centimeter (0·155 square

It is possible to effect the following results with this apparatus:

(1.) To determine the progress of the setting of a cement as a function of the time and weight, and thus obtain a diagram analogous to that shown in No. 1 (Fig. 2).

(2.) To determine the penetration as a function of the time, the weight of the needle being fixed; and thus obtain a diagram similar to that in No. 2.

(3.) To determine the penetration as a function of the weight after fixed periods; and obtain a diagram analogous to No. 3.

From a practical standpoint, diagram No. 1 evidently presents the most interest. To learn when the setting begins, nothing but the 1½ ounce rod withdrawn from the tube will be used. The setting begins when, the rod being placed quickly on the paste, the friction

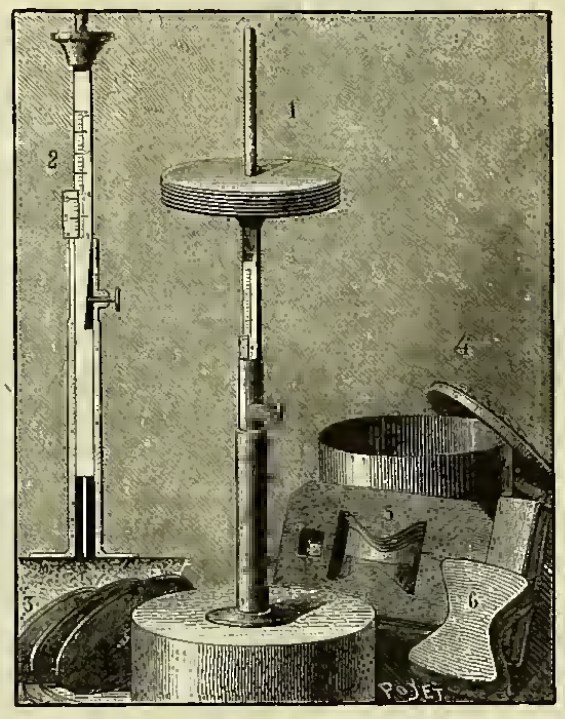


Fig. 1.—APPARATUS FOR TESTING CEMENT.

due to the nascent cohesion prevents it from entering the paste completely.

In Fig. 1, 1 is a general view of the apparatus; 2, details of the device; 3, disks; 4, box for the latter; 5 and 6, mould and core.—*La Nature.*

THE HOME OF MILTON.

CHALFONT ST. GILES AND MILTON.

The quiet rural village of Chalfont St. Giles, in Buckinghamshire, eight miles north of Uxbridge, was the retreat of John Milton in 1665, when the great plague raged in London. It is twenty one miles from London

The early Friends or "Quakers" had personal and local connections with that neighborhood, and Thos Ellwood, whose very interesting autobiography has lately been republished in Prof. Henry Morley's series of the "Universal Library," engaged a "putty box" at Chalfont for the temporary dwelling of the blind immortal poet.

Milton's town residence, at that time, was in Jewin Street, Aldersgate, and he was then composing "Paradise Lost." He finished this poem at Chalfont, and Ellwood, who had invited him there, invited him to begin the sequel, "Paradise Regained."

The cottage shown among our sketches of Chalfont St. Giles is the only house now remaining which Milton is known to have occupied.

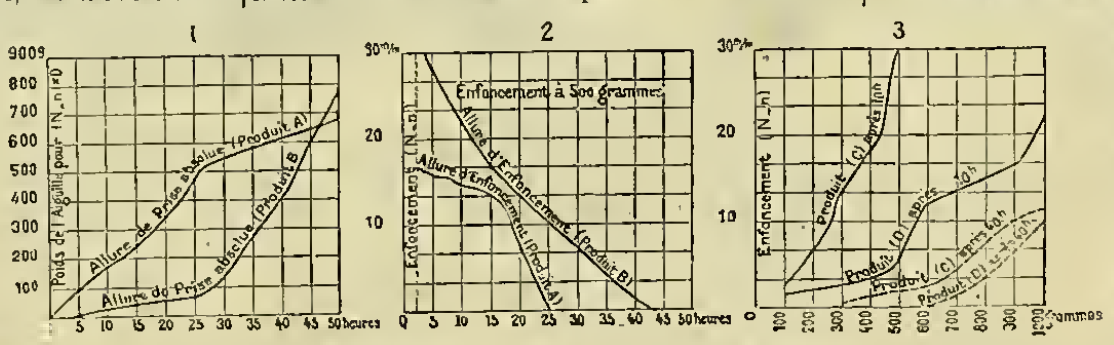


Fig. 2.—GRAPHIC CURVES OF THE SETTING OF CEMENT.

Mr. Laurence Hortlon tells us, in his "Literary Landmarks of London," that although John Milton was born and died in the metropolis, received part of his education and was thrice married there, and lived in many houses, within the hills of mortality, there is left to-day hardly a trace of anything that he touched or that is in any way associated with him.

He was born in Bread Street, Cheapside, in December, 1608, and was baptized in the church of All Hallows. Both house and church were destroyed by the fire of London in 1666.

As a boy he was sent to St. Paul's School, which also vanished in the conflagration of 1666.

After graduating at Cambridge ..d taking a Continental tour, Milton returned to London in 1639, and hired lodgings in St. Bride's Churchyard.

The house remained intact until 1824, when it was burned down, being at the time occupied by a hairdresser. Milton removed to Aldersgate Street, but no vestige of the house occupied by him there now remains. His next removal was in 1644, to the Barbican, where he afforded shelter to his first wife's relations, who were royalists.

The house No. 17 Barbican was in existence so late as 1864. A modern warehouse now occupies its site

From the Barbican, Milton repaired in 1646, to a small house on Holborn, opening backward into Lincoln's Inn Fields.

It was too remote from Whitehall to suit Cromwell's convenience, to whom Milton was then secretary. The Lord Protector summoned the poet to Scotland Yard, whence he migrated to a pretty garden house in "Petty France," Westminster.

The site forms part of the lawn of Queen Anne's mansions. An old tree was shown which he was said to have planted with his own hand.

In the house at Westminster, Milton lost the use of his eyes.

He was driven from it in 1660, upon the restoration of Charles II., which forced him to take shelter in Bartholomew Close, Duke Street, Aldersgate.

Before long he could return to Holborn, where he took a house in Red Lion Fields, now Red Lion Square.

His next move was to Jewin Street, Aldersgate, where he lived with his third wife and his daughters. The Jewin Street of that day has also passed away.

The declining years of Milton's life were passed in Artillery Walk, Dunlieil Fields, where he dictated to his daughters his "Paradise Regained" and "Samson Agonistes."

Here he died in 1674.

The house of two centuries since has entirely disappeared. The nearest approach to Artillery Walk, in name, is Artillery Place, Bunhill Row.

The remains of the great poet were consigned to the chancel of St. Giles, Cripplegate, where a monument has been erected.

The Rev. Pownoll W. Phillips, Rector of Chalfont St. Giles, Mr. James Gurney, and Mr. S. Sanders are trustees of Milton's cottage, which has, with the cottage adjoining, been obtained at a fair price from the owners, Mr. and Mrs. Tomson, of Sandhurst. The trustees, with Mr. T. Newland Allen, lord of the manor, and Colonel Phipps and Mr. W. Gurney, church wardens, form a committee to provide for its preservation.

Their intention is to set apart Milton's cottage as a reading room and museum for objects connected with the poet, and for other matters of historic interest to the parish and neighborhood.

A fund has been instituted to enable them to pay for the cottages, to repair them, and to maintain them for these purposes.

The sum of £400 or £500 is required, and subscriptions may be sent to the rector or church wardens, or may be paid to the London and Westminster Bank, 1 St. James' Square, S. W., to the account of the honorable treasurer of the "Chalfont St. Giles Jubilee Milton Memorial Fund," Samuel Sanders, Esq., J. P., of The Grove, Chalfont St. Giles, Bucks, and 7 De Vere Gardens, South Kensington.

As the intention to use part of one of the cottages as a reading room and museum has been adversely criticised, it should be explained that this particular use of the house is necessary, owing to the law of mortmain; but every care will be taken to prevent injury to the building. A reading and recreation room already exists in the village.

The cottage would not be kept as Milton left it, if it remained as an ordinary village dwelling, to be occupied by a laborer's family.

Our illustration of Milton's cottage, page 51, is copied from a drawing from Mr. Wilfrid Ball. —*Illustrated London News.*

Whitewash and Fire.

Whitewash has many uses, political and moral (or immoral rather), as well as economic. But as a fire extinguisher it has not been hitherto generally recognized here. "Do you know," said a scientific gentleman the other day, "that it is next to impossible to burn a whitewashed fence? And do you know further, that in France, to protect the frame and interior of other buildings from fire, the walls, beams, joists, and the underside of floorings are thickly coated with lime wash before they are placed in position? It is so, and if this course were adopted here it would save many a house, many a village, from destruction. I do not mean to say that it will prevent the spread of a fire once under great headway, but from its uninflammable character, it is a guard against the prime ignition that often leads to dire results." This little hint set the writer to inquiring, and the doctor's words were confirmed.—*Am Analyst.*

Why Pipes Burst.

The principal cause for burst pipes is frost. Water has the greatest density, that is, it occupies the least space, at a temperature 39·2° F. Above that temperature it expands, and below that temperature it expands until it reaches the freezing point, 32°. When the freezing point is reached, the water begins to solidify, until all the heat is expelled and ice is formed. The water has expanded nine per cent. in the operation. Below the freezing point, the ice contracts again.

After the first freezing occurs and the pipe is swelling, the ice next to the pipe contracts or breaks, and allows more water to come in contact with it. This, in turn, freezes, expands, swells the pipe a little more, and then contracts. This operation is continued until the pipe bursts. When this occurs, there is a movement of the softer ice to the break, and the space left fills with water and freezes, thus enlarging the fissure a great deal. This soft ice frequently runs out on the pipe and forms icicles.

This expansion of water may be illustrated by taking a basin even full of water and exposing it to a temperature lower than the freezing point. When the temperature of the water reaches 39·2°, it begins to expand, and will run over until it is frozen. After the surface is frozen, the solidification of the lower portion of the water causes the center to rise above the level—a phenomenon which is often seen. The mere fact that water when frozen is less dense than when liquid is proved by the floating of ice.

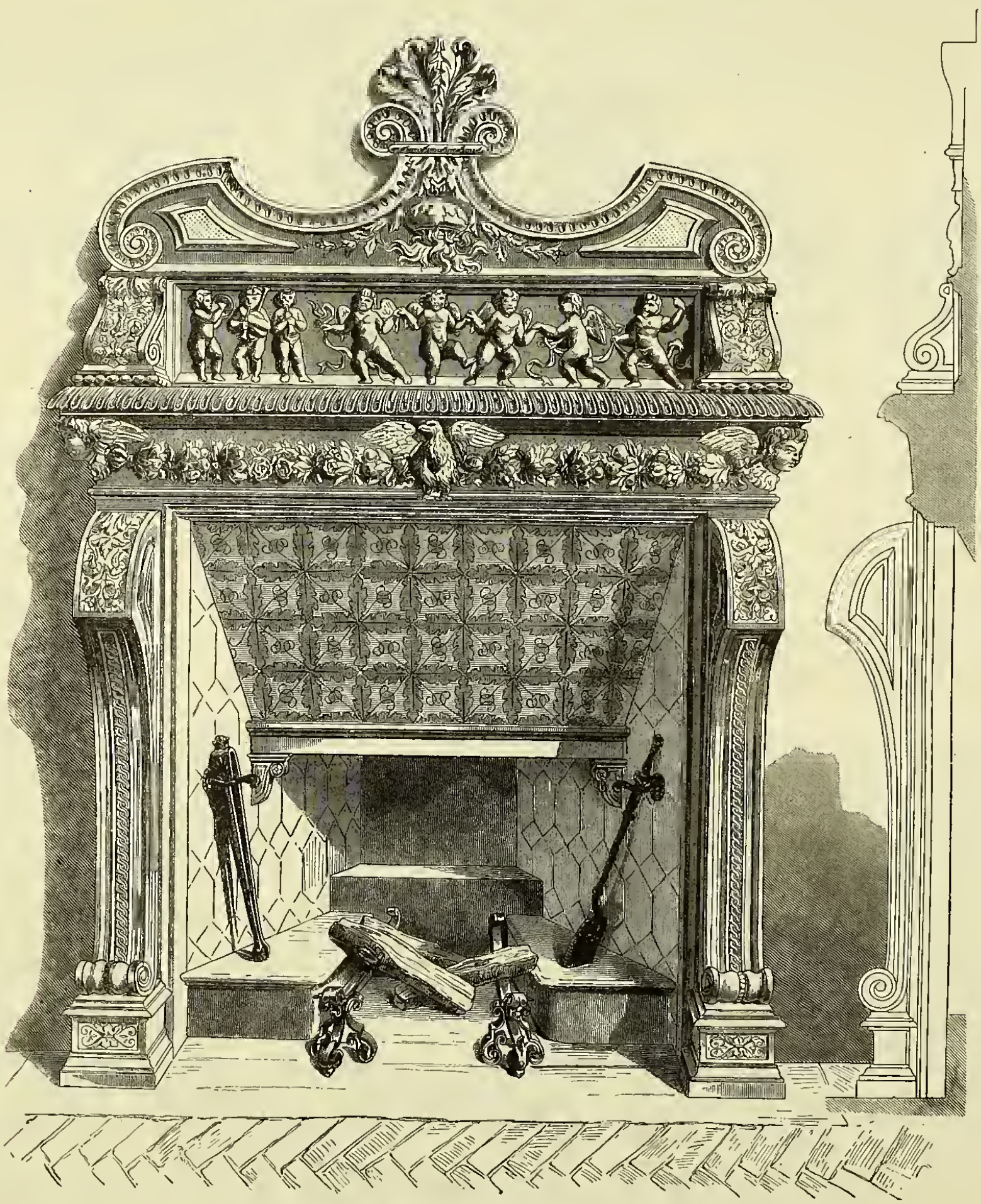
Another cause for the bursting of lead pipe is water hammer. Under direct pressure systems of water supply, the water hammer is sometimes very forcible, and its continuation often develops a burst at some weak point in the pipe. A remedy to prevent this consists of a rubber cushion, which gradually breaks the force of the blow.—*Sanitary News.*

How Lamp Chimneys are Made.

First they use pure white sand, found in but few localities, which, when thoroughly washed and dried, is almost white as snow. Then the potash (purified) and the lead, in the form of oxide, perfectly pure, are added to the sand, and thoroughly mixed until the batch resembles ordinary sugar in grain, but is quite red in color. It is now ready to go into the pots—twenty-four in number, made of a peculiar kind of clay, being from 42 to 48 inches in height and about the same in width. These pots are closed at the top to prevent the fire from injuring the melted glass, with the mouth on the side near the top. The furnace being circular, the pots when placed in position, and covered with fire brick, present their open mouths only, and when looked into resemble a hot summer's sun.

When in this condition, the pot is filled with the mixture above mentioned, closed tight, and in about twenty-four hours is ready for work. A workman called a gatherer dips his pipe into the melted mass, and gathers enough on its end to make a chimney. This he rolls on a smooth iron plate to get it evenly on end of pipe, when he blows it about the size of a boy's top, and hands it to another workman, who further blows it up, and proceeds to make the lower part of the chimney, which fits the burner. This he does by forming a small knob on the end of the now pear-shaped bulb, giving it a sharp stroke with his shears, breaking the knob off, leaving a small hole in the bottom of the bulb.

It is now heated red hot again, and the lower end of the chimney formed by the blower whirling and spreading the glass with a tool resembling sheep shears, but longer and narrower blades. The chimney is now broken off the pipe and put into a "snap," an instrument which holds it as one would clutch an apple firmly in the hand, and heated red hot. The top is finished by machinery.—*Cin. Grocer.*



DESIGN FOR A MARBLE FIREPLACE.

Full plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.

A COTTAGE OF MODERATE COST.

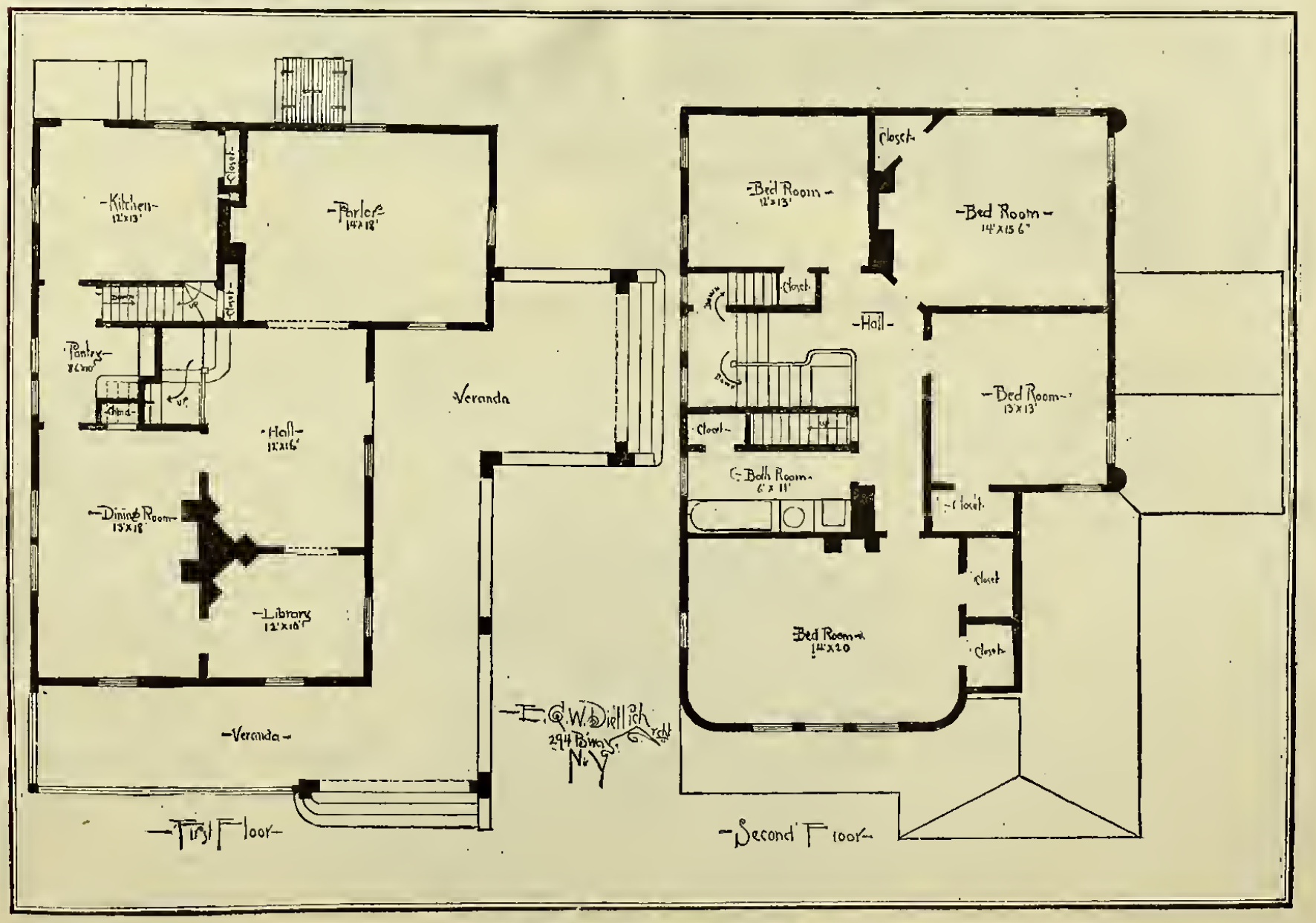
Our plate exhibits a cottage designed by E. G. W. Dietrich, architect, N. Y. Our engravings are from the *Builder and Woodworker*. About five thousand dollars is our estimate for the cost of this dwelling. This is a very handsome structure, cozy and homelike.

The Largest Vase in the World.

Whatever supremacy may be truthfully claimed by America in the line of all kinds of implements, watches, and jewelry, England leads the world in the line of art pottery. A well known English manufacturer of pottery has the honor of producing the largest and one of the most beautiful vases in the world. This vase consists of a pedestal, which, rising from a square plinth, supports a globe representing the earth surmounted by a figure of Ceres, who, together with a group of cupids, are showering gifts of fruitfulness upon the earth. Around the center of the globe runs a frieze, divided into four panels, on which are cupids, busy in the pursuits typical of the four seasons. The subjects are separated by bracelets, on which are other figures emblematic of the season. The pedestal contains a splendid frieze, on which are represented something more than sixty cupids occupied in rural work. The plinth is artistically ornamented in keeping with the general design. The color of the globe is a shade of green called celadon, the figures are china bisque, and the other decorations white china.

The whole stands eleven feet in height, and the diameter is six feet four inches, and, notwithstanding its proportions, this vase is elegant, chaste, and thoroughly artistic. The cost of this huge ornamented piece of pottery is $16,500.

A RURAL novelty has been introduced into France, and is called a plant tent. It is of quite fairy-like dimensions, something like a lamp shade or toy parasol, which is placed over delicate young plants as a protection against hoar frost and hail. The cost of a thousand is but 50s., and the device should be useful to place over young tobacco plants, or many other delicate nurslings transplanted from frame beds into open gardens.



A COTTAGE OF MODERATE COST.

A CHURCH OF MODERATE COST.

We give a design for a church of moderate cost, say $5,000, by C. A. Dunham, architect, Burlington, Iowa. It has 308 seats, built of wood, ceilings of pine, finished roof timbers, stained glass windows.

An English Laundry.

The following account of a large English laundry is condensed from the columns of an English paper. English laundries present several distinguishing features when compared with those of this country. In England, it is rather the rule than the exception that laundries should be owned by joint stock companies, while here the proprietors are usually individuals or firms. Over there, it is considered almost indispensable to have a lady in charge of the operations, and the British manageress occupies the place held here by the manager or foreman. Another difference is that manual labor is employed to a greater extent than in the American laundries, where machinery does nearly all the work.

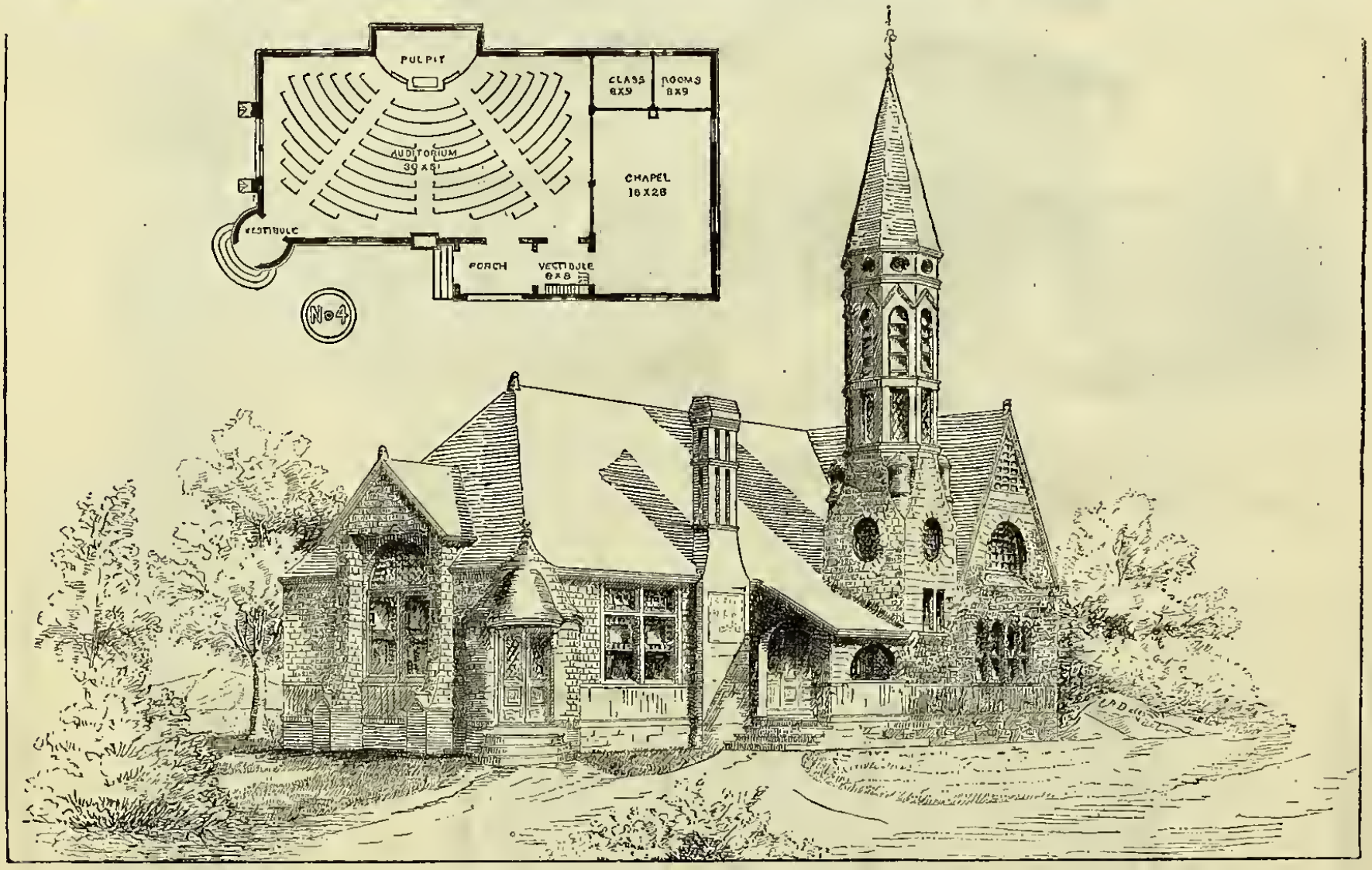
The laundry to be described is that of the London and Provincial Steam Laundry Co., with works at Battersea Park road, in the suburbs of London. These are said to be the largest laundry works yet opened in England, and cover a space of upward of an acre and a half, and afford employment to some twenty-five cent improvements. The vans, which at rare intervals bring infected linen to the Battersea works, are lined throughout with zinc. The articles are collected, not in baskets, but in open wirework crates, which are delivered direct into the proper house, and forthwith bodily inserted, without unpacking, into the disinfecting chamber, where they are subjected to dry heat, the only thoroughly effective process yet discovered. Even when thus dealt with they are not free from quarantine, the whole process of washing, etc., being carried on in the same isolated house. The severest penalties are demanded and enforced, not only against any person sending infected articles without giving notice, but against any person employed on the premises who shall fail to acquaint the managers of any case of infection with which he or she may be brought into contact. An unpleasant, but important, subject may be dismissed with the assurance that the management of this department is simply perfect.

The receiving room is about thirty feet square, into which the sturdy square baskets in which the linen is collected are brought unopened. Each of these baskets is devoted to the use of a separate customer, who keeps one of the duplicate keys of the rather elaborate padlock by which it is secured, the other being retained on the premises. The baskets having been opened and contents checked and marked, they pass into a second experienced in obtaining an adequate supply of help for this kind of work, though good wages are paid. For curtains, lace, and the like, there is a separate room, in which these fragile and unwieldy articles are neither ironed nor mangled nor calendered, but carefully strained on frames over a vast range of steam pipes.

An important part of all washing operations is the drying, which is here done in a fine open yard of nearly an acre in extent, provided with wide stretches of lawn for bleaching purposes. When the weather is unpropitious, the necessary operation is carried on with equal expedition in a spacious drying room, opening into the mangling and calendering room, and fitted with a magnificent range of drying frames, each twelve feet in length by seven feet high. The drying ground is fitted with an arrangement of ornamental iron posts and strong galvanized wires, specially designed to preserve the articles intrusted to them from the damage frequently inflicted under the old system of cords and clothes pegs.

The boiler house, engine room, stables, and sheds for vans do not call for particular mention.

One of the most important features of the entire establishment is the well, over four hundred feet in depth, sunk in the yard at a cost of something over £600, and extending into the chalk, from which it ex-



DESIGN FOR A CHURCH OF MODERATE COST.

men and one hundred and eighty employes of the fair sex. This laundry is now turning out from eighty to ninety thousand pieces of all descriptions every week.

The buildings are sky-lighted throughout, and care has been taken to give them a pleasing architectural effect. The works are entered by double gates, which give admittance to a covered courtyard, where the wagons or "vans" as they are termed in England can discharge and receive freight, a very important provision in a rainy climate. There are neat offices, a large dining room for the employes, and suites of apartments for the manageress and officials—the whole of the arrangements being made to secure perfectly healthy conditions and the maximum of comfort for all employed in the building. The main body of the building, in which the laundry operations are carried on, consists of one principal range, with an area of 154 feet by 140 feet, and two smaller blocks are devoted to the stabling and van department. One block, admirably isolated from every other part of the building, is set apart for the exclusive dealing with infected linen, no single article of which is ever allowed, from the moment of its entrance into the company's premises to that of its departure from them, to approach within a considerable distance of that portion of the building devoted to the washing of articles with a clean bill of health. So much attention has lately been devoted to sanitary measures having for their object the prevention of contagion, that it is worth while to show how the London and Provincial Laundry Company to some extent anticipated the most recompartment containing seven cells, each occupied by a young woman, who sorts out the different pieces for the wash room.

The general wash house is a lofty apartment, with an area of about fifty by thirty feet, having down the center a double row of washing machines of various sizes. Along the north wall is a range of large sized pigeon holes or racks, each capable of containing, when duly folded, just so many articles as can be cleverly introduced at one time into the open mouth of the washing machine, thus seriously economizing the time occupied in charging them. Along the opposite wall is a range of washing and boiling troughs for such articles as may require such methods of handling, with an ingenious tramway arrangement by which the manipulation of the hot and dripping articles under discipline is much facilitated. At one end are tanks of boiling soap solution, cunningly compounded after a recipe which, without the use of chemicals, produces in some half dozen turns of the ponderous machine a lather of remarkable thickness and fineness. At the opposite end are "hydros," in which, when washed and rinsed, the various articles are whirled round and round at the rate of four hundred revolutions per minute.

The mangling or calendering department contains, besides the usual machines, a calender said to be the largest ever constructed, carrying a "glosser" capable of manipulating the largest sized table cloth unfolded. In the ironing rooms scores of young women are employed, and we are informed considerable difficulty is tracts a supply of water running to eighteen or twenty thousand gallons per diem, and described as admirably soft. The laundry uses in a year fifteen tons of soap and about forty-two tons of starch.. The net profit realized by the company last year was $12,000, which allowed the payment of a dividend of six per cent.

Some of the figures given are rather surprising, such as the extractor making only four hundred revolutions per minute. In this country a much higher speed is given, and cases are recorded of extractors being run at 1,800 and even 2,000 revolutions per minute. This is dangerous and altogether unnecessary, for as we have pointed out in a former issue, the limit of effective power is reached at 1,500 revolutions in a minute. Nothing is gained by a higher rate of speed, and the risk of bursting is vastly multiplied thereby.—*Nat. Laundry Journal.*

Plans and Specifications.

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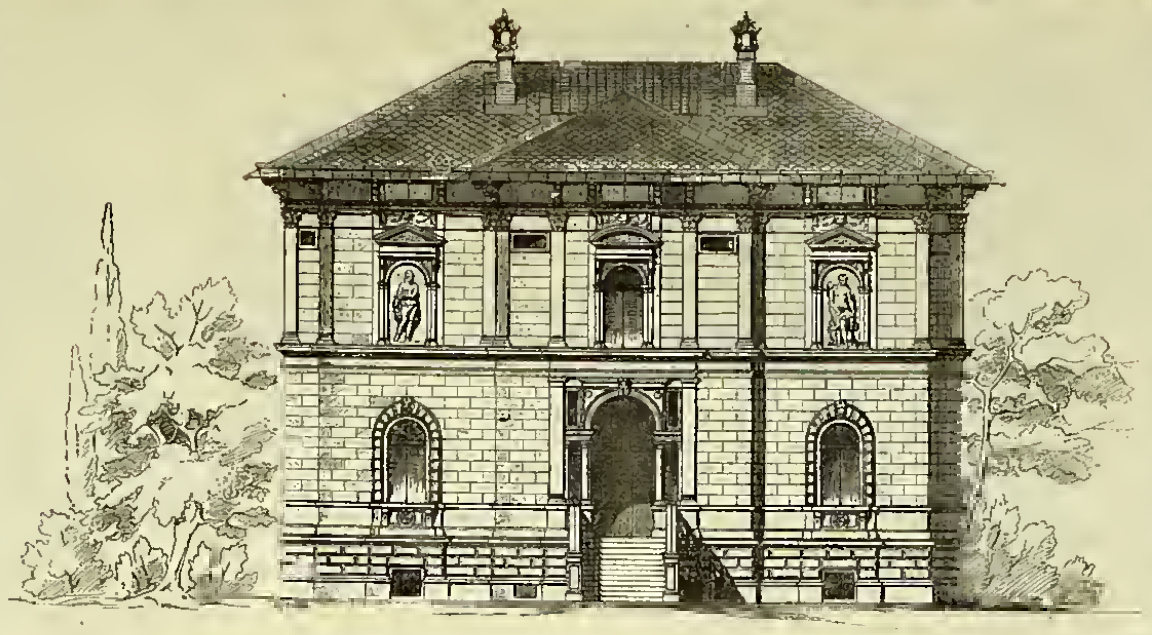
AN AUSTRIAN VILLA.

We give two elevations and a floor plan of an Austrian country house, at Bozen, by L. Theyer, architect, of that place. From *Architektonische Rundschau.*



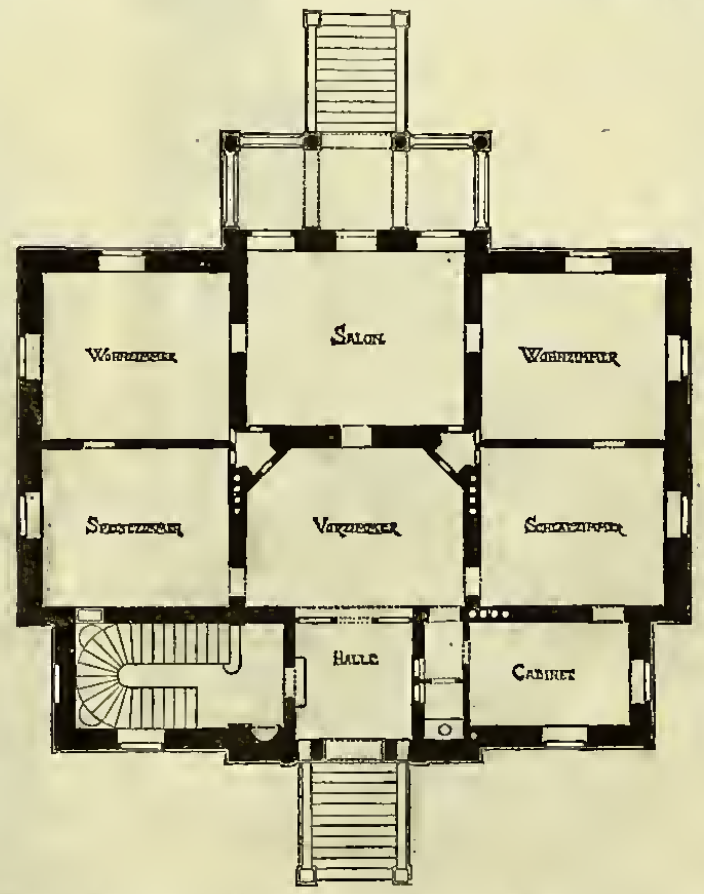
Mud Architecture in Persia.

Whether the Persian architecture was contemporaneous or derived from the Assyrian, Egyptian, or Indian, is a question into the investigation of which I am at present not prepared to enter; but certain it is, judging from the voluminous writings of competent men, that the Assyrian and the Egyptian were the most ancient styles which formed the groundwork of all others that adorn the various parts of the globe. Until recently it was supposed that the Persian architecture owed its origin to the Indian, but the study of the archæological remains of the various Eastern countries has enabled the specialists engaged in the work to fix the date of the former structures far anterior to that of the latter or Indian. The birth of the Roman and Grecian styles, their semblance and peculiarities, are no longer invested with doubts or involved in mystery, which had so long exercised the minds of the enthusiastic students and travelers of the old and the new worlds. The arch semicircular, Gothic with their many variations—the pillar, the capital, the dado, the architrave, and the various details of ornamental construction—are no longer ascribed to accidental observations or similitude, but have descended to us from remote antiquity as the triumphs—though rude—of the Assyrian and Egyptian structural art. The evolutionary process which the art has, during its progressive descent to us, passed through has given to the world architectural beauties unapproached in the annals of ancient architecture.

If architecture is correctly defined as being nothing more or less than the art of ornamental construction, then I am bound to say that of all Oriental nations the Persians appear the most advanced in the art wherein mud or earth plays a most important part. Any one journeying through or sojourning for a short period in Persia cannot avoid being struck with the high excellence which mud, common mud, can be made to attain in its employment in architectural works. Forts and fortresses, courts and country houses, palaces and public offices, colleges and convents, mosques and minarets, towers and temples, caravansaries and crown buildings, bazars and breakwaters, are all made of mud—despicable mud, whose qualities in the constructive art are only appreciated and acknowledged when moulded into bricks and burnt in a kiln. This is not all, for even culverts or bridges of small span are also made of mud, a single arch of 10 to 12 ft. spanning the water's course from bank to bank at springings whose line is far above the highest water level. Nearly all the buildings in Persia are built of mud and sun-dried bricks ornamented with gatch or gypsum, and a short account of building and construction after the Persian fashion will not be out of place in your journal.

The principal materials which enter into the composition of a mud building are straw, quicklime, gypsum or gatch, and stone pebbles. Any one desirous of having a residential house in or out of town has only to give notice of his intention to the mehmarbashi or the principal architect of the city or town—generally a Persian—who either repairs to the party himself or deputes his assistant or bannabashi to ascertain the size, style, and description of the building required. This obtained, the mehmarbashi or architect prepares a plan which he personally takes to the saheb; and, after explaining to him the general outside features and internal arrangement, and the cost probable, he leaves it to him to decide when, where, and how the house should be built. No building is started unless the day is auspicious—rozikhair—and when that day is determined upon, as also the size, style, etc., fixed by the future owner of the building, the mehmarbashi is sent for, and the hukum or order given.

Thereupon the builder commences operations. Brick making being the first thing, he sends his falehs or assistants to proceed with that work. The bricks are made of clay previously prepared. This is done by first digging the ground and allowing the clay to remain exposed for two or three days in the sun. It is then saturated with water and exposed for two days longer, when it is subjected to the operation of treading or tempering. The clay is then moulded into bricks 9" × 9" × 2", and the surface is luted over with water mixed with chopped straw or kah, of which seven seers are used for every 1,000 bricks moulded. This superficial plastering of straw is intended to prevent the newly made bricks from cracking. A single moulder can manufacture from 2,000 to 2,500 bricks per diem of six hours. The cost varies from 8 annas to 12 annas per 1,000, and sometimes more when they are intended for the kiln. When the bricks (sun-dried) are ready, the mehmarbashi marks the foundations according to the rung or plan, and the pits or trenches are then dug, and the whole exposed for several days, generally one week, until the trenches and debris from the same are quite dry. The clay thus dug is of very tenacious character, and is called roost, a kind of fire clay. The foundation is laid in with this clay, mixed with quicklime. It is well treaded and rammed, and then allowed to stand over for a week. The thickness of walls is determined by the weight and height of the superstructure, and is invariably spoken of as so many fingers breadth. The walls are built with unburnt bricks and clay, and the arches with the same bricks and gatch or gypsum. A bannabashi or a mason seldom uses the rule or plumb line when building a wall, his guide to straightness and verticality being the eye and the trowel.

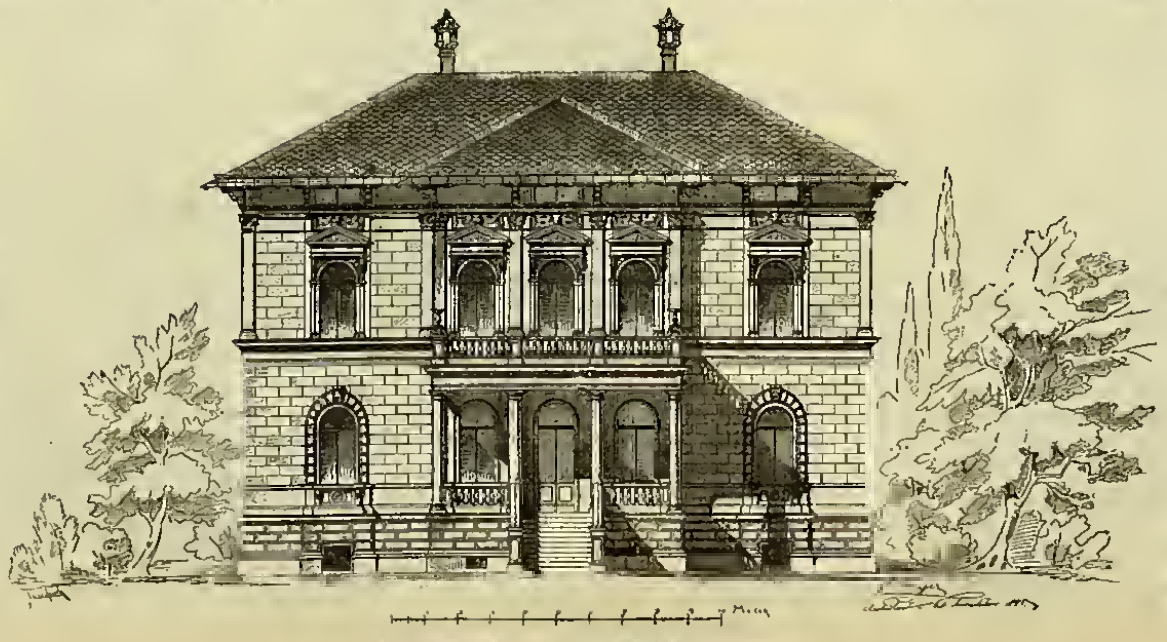


The small arches, of which there are many varieties, are never built with centerings, as in this country. It is sufficient when the first ring is made; all others follow it endways until the whole arch is completed in. It is made of a single brick on edge, and kept in position in course of construction by means of the gatch and wedges of pebbles. The gatch dries as soon as applied on the edge of the bricks, which are pressed or placed in position before it dries or dies. The pebbles are used as wedges only in the extradol joints of arches, where the joint is wider than in the soffits. The circularity of the arch is determined by means of a line or string from the center of a bar placed along the springing of the arch, or, rather, span, or parallel to it, the said string being equal to the radius of the circle of which the arch is a part.

Where arches exceed 10 ft. in span and 30 or 40 ft. in length, arched ribs are put in over centerings, placed 10 ft. apart, and the arch work of the spaces is filled in, as before, with bricks on edge, single, but without the help of centerings. Except in tarbi, or extra strong arches, where the bricks are used on their planes or flat, *i. e.*, endwise, all other kinds of arches, such as the gahri or Parsi, which is never or seldom built without shaloob or centering, the almaztrash or diamond-shaped, and the ghace or pointed—Gothic—are invariably built of single brick on edge.

When the arches or domes are completed, the spandrels, or sandooghas, are filled up with broken bricks, carefully arranged. Over this is laid fine, loose earth, which is rammed down to the required level preparatory to receiving the khahgil plaster, which is prepared in the following manner: The clay, to which is added chopped straw, is first made and well tempered by the feet. It is then allowed to stand for several days, with water just covering the top of the clay, which is mixed in small tanks. When thus prepared, it is laid over the loose earth which had been rammed level previously, and thus the roof is completed.

The thickness of the khahgil plaster for the roof ranges between 3" and 4". After the roof is completed the parapet walls facing the streets and the neighboring buildings are raised 5 and 6 ft above the level of the roof, tapered, and similarly plastered with khahgil. The facade of the building is either plastered over with khahgil of finer quality colored with red or yellow ocher and lined and paneled out in gatch or gypsum or entirely plastered with the latter and ornamented with mouldings of the same material. The interior of the building—the rooms—are generally plastered with khahgil of the finest quality, called sungil, which is composed of fine clay, the husk of wheat, horse or cow dung, and the coloring matter. These are mixed in large vats and allowed to stand for several days—seven or eight days—when the clay is considered ready for use. It is then applied to the wall with a trowel, care being taken that it is uniformly laid. The projecting angles of walls and recesses are picked out in gatch and colored to suit the



AN AUSTRIAN COUNTRY HOUSE.

khah or rather sungil plaster. A single masou will lay in 2,000 bricks for a day's work. When the wall rises beyond the reach of assistants or hearers of bricks and clay, the bricks are not taken up in hod or basket, but are thrown up from hand to hand to men placed on scaffoldings or stages until they reach the bricklayer. Leather gloves are worn by the throwers to save their hands from injury arising from the constant friction between the bricks and the palm of the hand.

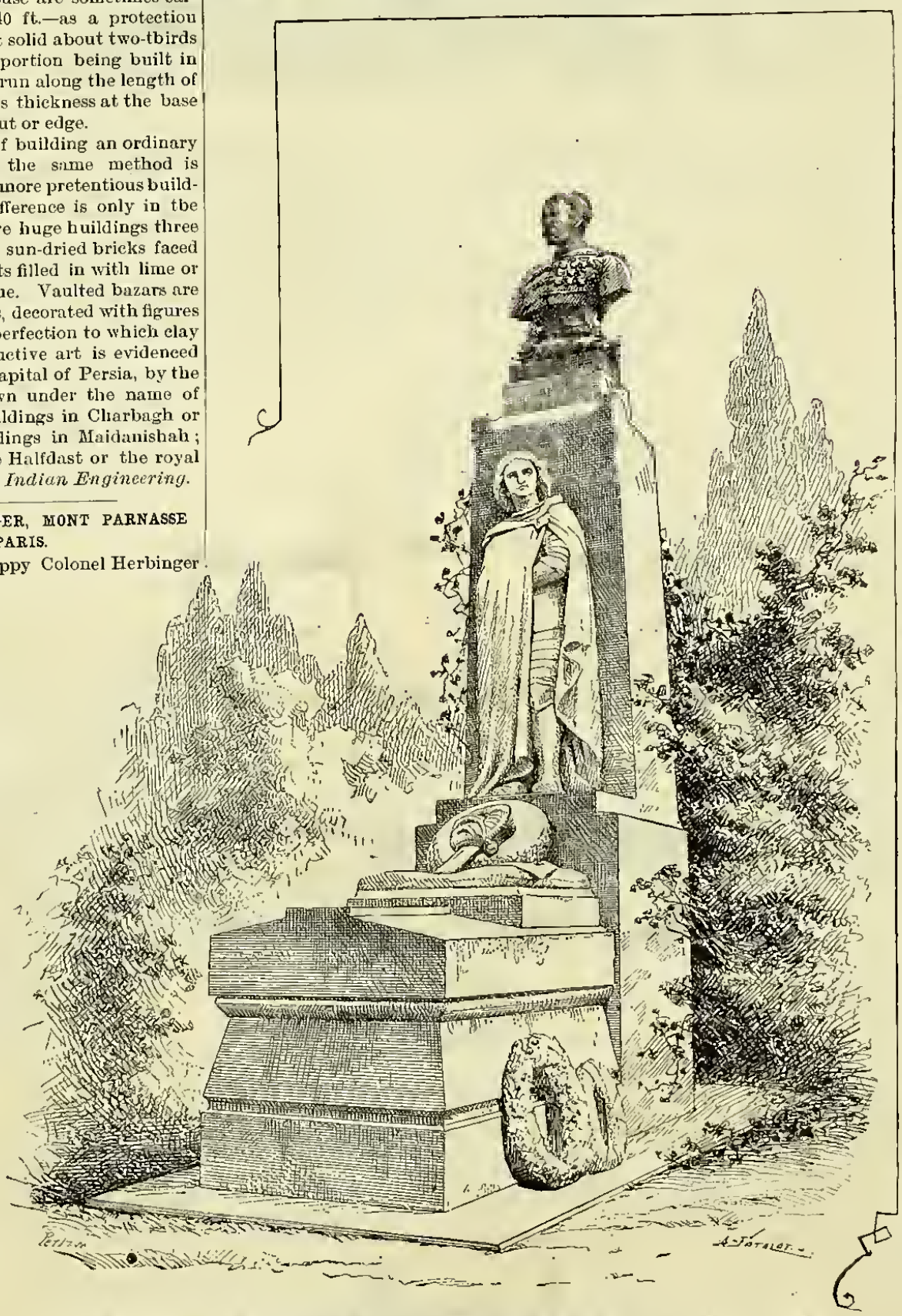
Gatch is only used in building of arches or mouldings, and is never mixed up in larger quantities than a few seers at a time when employing it as a cementing material or for mouldings. When in course of preparation for these works, it is kept in constant motion to prevent it from dying or getting flat, and therefore useless. The gatch is much appreciated for its quick setting and adhesive properties. It is the only and best cement used in arched masonry and mouldings.

The inclosure walls of the house are sometimes carried to great heights—30 to 40 ft.—as a protection against thieves. They are built solid about two-thirds of the height, the remaining portion being built in sandooghas or chambers which run along the length of the wall—generally of enormous thickness at the base and gradually tapering to a point or edge.

This is the modus operandi of building an ordinary dwelling house; and though the same method is observed in the construction of more pretentious buildings, public or private, the difference is only in the choice of materials. There are huge buildings three and four stories high, built of sun-dried bricks faced with burnt bricks and the joints filled in with lime or fire clay and glazed green or blue. Vaulted bazars are entirely built of sun-dried bricks, decorated with figures and flowers in gypsum. The perfection to which clay has been carried in the constructive art is evidenced in the former and the present capital of Persia, by the magnificent caravansary known under the name of Caravanserai Mukhlis; the buildings in Charbagh or four gardens; the public buildings in Maidanishah; and last, but not the least, the Halfdast or the royal palaces, old and new.—*Zulpah, Indian Engineering.*

TOMB OF COLONEL HERBINGER, MONT PARNASSE CEMETERY, PARIS.

This monument to the unhappy Colonel Herbinger was erected last December, by his mother. The base, measuring 3 ft. 8 in. × 7 ft. 4 in., is placed above the family tomb. Above it rises a statue of Joan of Arc, from whose family Col. H. descended, and a column surmounted by a bronze bust of Colonel Herbinger. Below the statue, upon a cushion, lies the wreath of victory, and upon that is thrown a broken sword. M. Etex, sculptor.—*La Semaine des Constructeurs.*



TOMB OF COLONEL HERBINGER, MONT PARNASSE CEMETERY, PARIS.

Window Glass.

The base of all glass is silica. The most convenient form in which it is found is in fine sand. Upon the due proportion of this substance in glass depends its compactness of body, brilliance, and capacity to withstand sudden changes. It often happens, either on account of want of sufficient heat in the furnace, or in order to save time in the melting or founding, that too small a proportion of silica is employed. Glass which has this fault may be known by its rapidly attracting moisture. Plate glass is composed of sand, carbonate of soda and chalk, with small quantities of arsenic and manganese. The proportions vary at different works, but the general proportion is: Lynn sand, 400; carbonate of soda, 250; ground chalk, 35—by weight.

The quality of the glass depends upon the quality of the alkali. Plate glass is melted in large open pots. The furnaces are square, containing sometimes four, sometimes six pots each. When the glass is melted, which takes twenty-two hours, it is removed to another furnace, where the pots are smaller, of a cylindrical form. Here it is fined, which occupies four to six hours, and when free from air bubbles and impurity, the pot with the glass is removed bodily from the furnace by means of a crane, and hoisted to the end of the casting table, upon which the glass is emptied. A large iron roller which works inside the flanges of the casting table is then made to pass over the melted glass in order to flatten it out. It is then removed upon a wooden table on wheels to the annealing arch, which is now at a high temperature, and here it is excluded from the atmosphere until cold. The glass is rough and uneven, but it is afterward cut flat by machinery, and then smoothed and polished.

It is these processes which render plate glass so costly. Crown or window glass is of much the same composition as plate glass, except that a cheaper description of alkali is used. The ordinary mixture is: 500 cwt. of Lynn sand, 2 cwt. of ground chalk, and 1 cwt. each of sulphate and carbonate of soda. The square furnace and the open pots are used, there being generally six pots on each furnace. It takes from fourteen to twenty hours to melt this glass, and it then requires to stand four to eight hours to allow it to become free from all air bubbles and to cool sufficiently for working.

Window glass is formed by blowing. Upon the blowing iron is gathered at three several times (the fluidity of the glass never allowing fewer) the weight of glass necessary to produce the table, and which weighs 11 lb. This is then blown out, leaving a solid lump at the farthest extremity from the blowing iron for attaching the punty. This is called the bullion. The punty being fixed to the bullion, the blowing iron is relieved by merely touching the glass with a wet iron. Being firmly attached to the punty, it is removed to a small cylindrical furnace, called a flashing furnace, where a rotary motion being given to it, increasing as the glass becomes softened by the heat, the centrifugal force, together with a little sleight of hand on the part of the workman, produces a flat circular plate or table, as it is then called.

British plate or German sheet glass is of the same composition as plate glass, but the manipulation is different. The glass is blown into open cylinders, and when cold these are cut open along the length with a diamond and placed in a flatting furnace, which is at a sufficient heat to bring the glass into a semi-fluid state, so that it falls quite flat. The sheets thus made are afterward cut flat and polished. The size of the sheet is restricted to what can be blown and worked by one man. It is cheaper than plate glass, because all waste is avoided and less cutting is required.—*A. Pellatt.*

Basswood.

Basswood is commonly ranked among woods as a scalawag. It is not so much of a scalawag, however, as some people think it is. For certain uses it is admirable. For organ keys, trunks, several kinds of small boxes, carriage bodies, woodenware, paper pulp, and for many articles which are turned, it is just the thing. In some sections of the country, as a matter of economy, it figures as a building wood, but when used on the outside of a structure, the builder in due time discovers that it is false economy. A Wisconsin manufacturer is making basswood doors which he sells as a No. 3, and calls them linn, another name for basswood. Basswood is also known as linden, and in some sections it is called the bee tree, from the fact, undoubtedly, that its flower is a favorite with the honey bee. There is a curious story current in Wisconsin sash, door, and blind circles that is worth repeating. A manufacturing concern shipped a Western customer a car or so of doors with basswood panels. It was probably an experiment to the extent that the doors were sent out as a feeler to ascertain if the average retail dealer in the "rowdy West" could tell a basswood from a pine panel. In this case he knew it wasn't pine, for on receipt of the doors he wrote the Wisconsin men, asking them what they took him for. They didn't tell him what they took him for, but, presumably before the letter was received, a representative of the house started for the Western customer, and before the customer had time to make any complaint the representative informed him that his house had made a mistake. It had made to order for an Eastern man a lot of doors with applewood panels. By mistake these doors were shipped to this Western customer; the doors were expensive; the representative trusted that the customer would at once see the point, and, so far as he could, correct the mistake of the house. The customer saw the "point," and promised to pay an extra price for the doors, and is probably dealing them out to builders as an extra choice article. If the story is founded on fact, it is a decidedly rich one.

The worthlessness of basswood for some purposes and its value for others shows simply that it was intended that man should go around with his eyes open. If he puts basswood in a weight-bearing position, or makes a handspike of it, he will get left. But it is a necessary cog in the wheel, and if rightly used in the right place, the machinery runs along without a hitch.

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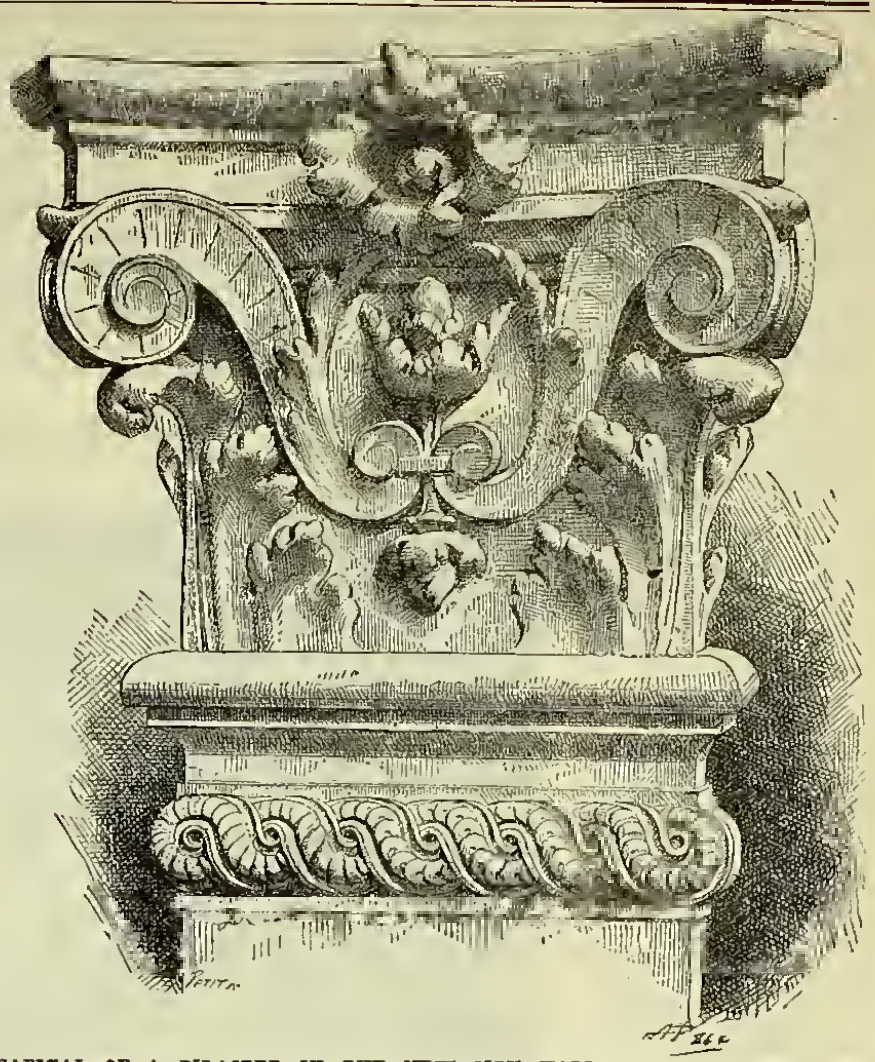
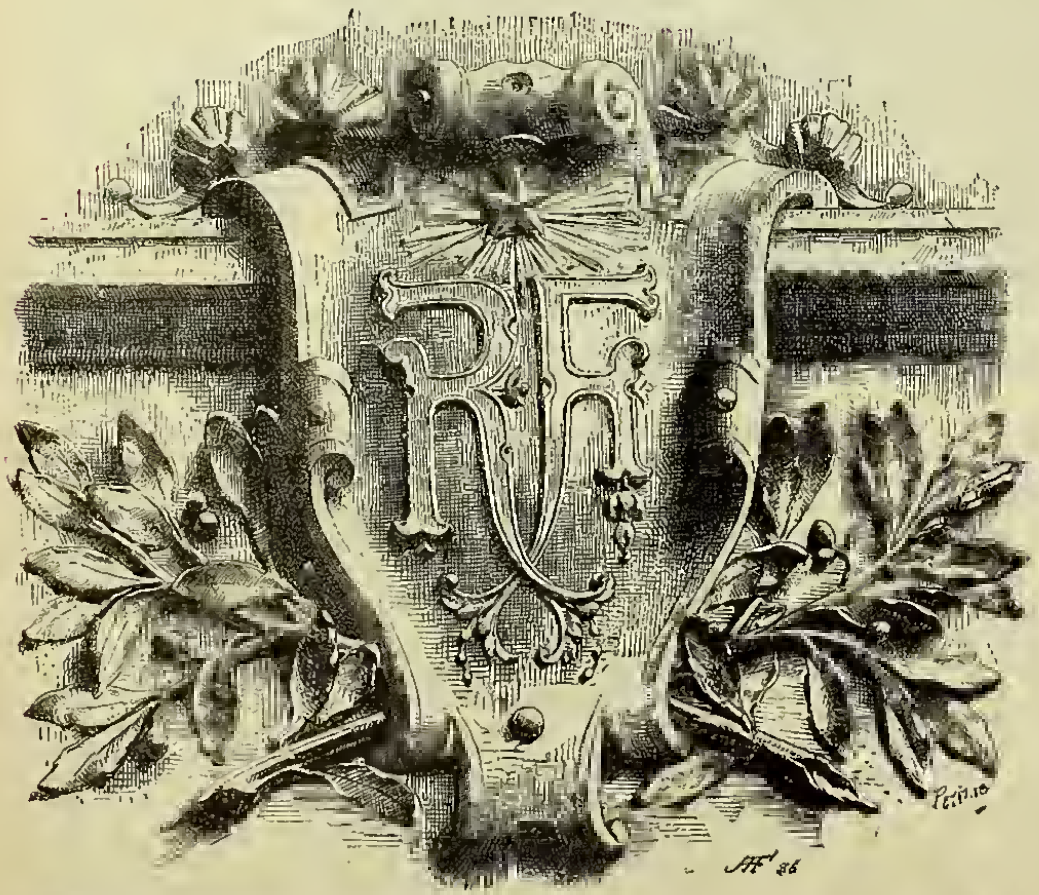
INTELLIGENT FORCE—CARYATID ORNAMENTING AN INTERIOR DOOR IN THE HALL OF ST. JOHN, NEW CITY HALL, PARIS.



CAPITAL OF A PILASTER IN THE NEW CITY HALL, PARIS, IN THE STYLE OF THE TIME OF FRANCOIS I.

BRACKET SUPPORTING THE CLOCK, CITY HALL, PARIS.



MONOGRAM (REPUBLIQUE FRANCAISE) FOR THE NEW CITY HALL, PARIS—CARVED IN STONE.

PLENTY—CARYATID ORNAMENTING AN INTERIOR DOOR IN THE HALL OF ST. JOHN, NEW CITY HALL, PARIS.

SELECTIONS OF CARVED WORK FROM THE NEW HOTEL DE VILLE, PARIS.

Painted Plate Glass Mirrors.

This style of paintiug, which has lately become so fashionable, appears to be of Roman or Venetian origin, and in many old palaces on the Continent traces of it, dimmed by the lapse of ages, may be met with. At the present time the art has been to a considerable extent revived in Rome, and the artist Fornari's work is esteemed to be superior to that of the old specimens. His designs are in the old Cinque Cento style, and are remarkable for the richness and variety of the flowers and arabesques introduced. The work is not difficult, and can be satisfactorily accomplished by any amateur who has a good knowledge of flower and bird painting. It is done upon deeply beveled looking-glass, which is then framed in wide, ebonized frames, or in a china mount, or in Salirati's celebrated raised and colored glass frames. When framed in ebonized wood, the painting is so designed as to droop over the glass from one side, and to be carried on over the side of the frame.

By this means the reflection of the painting is clearly seen, and yet the glass is useful for other purposes. Brackets and long mirrors for boudoirs are mostly ornamented in this way, while plate glass stove screens and other large articles have their ornaments springing from the bottom, from which the design rises and spreads evenly over a great part of the mirror. Such subjects as apple blossoms, cherry blossoms, and hawthorn are the most suitable for brackets, while tomtits, goldfinches, butterflies, and bees are introduced either upon the branches or hovering about the flowers. For fire screens, water lilies and their leaves, flags, mixed with the flowering rush, meadow sweet, and purple loose strife are good, with kingfishers, moor hens, and dragon flies as their accompaniments.

Draw out the design in outline upon cartridge paper, then take some lithographic ink and a lithographic pen, and with these trace the outline upon the glass, keeping to the prepared design as a guide. When the outline is dry, fill in the design with a coat of flake white oil paint, which mix with a little *siccatif de Courtray* as a drier. Use a red sable hair brush, and work the oil paint on it quite smoothly. Then proceed as in ordinary oil painting.

Flour Adulterations.

Of the many substances with which flour is adulterated, those in most frequent use are plaster of Paris, the dust of burnt bones, pea or bean meal, and potato flour. An easy general mode (writes an expert) of testing the purity of flour is to squeeze it in the hand. The cohesiveness of wheat flour is very great, and consequently the lump so squeezed in the hand will be a longer time before it breaks and falls if of wheaten flour than if the flour be adulterated. Plaster of Paris, the dust of burnt bones, and pototo flour are also much heavier than wheaten flour, so that adulteration by them may be easily detected. A sack which will contain two hundredweight of wheat flour will hold three of potato flour, so that, should the flour be adulterated with any amount of potato flour, it may be detected by means of its weight.

Should pea or bean meal be mixed with the flour, it may be detected, if in any considerable quantity, by pouring boiling water upon a cupful of the flour, or by toasting a piece of bread made of it, the odor of the pea or bean being sure to rise while the meal or bread is hot.

Adulteration by means of the flour of inferior grains is more difficult of detection, but may be ascertained by pouring upon a spoonful of flour a little pure spirits of hartshorn. If the flour be wholly of wheat, the hartshorn will render it of a yellow color; but if it be adulterated with corn, the hartshorn will turn it to a pale brown, and if it be adulterated with pea or bean flour, it will become a darker brown.

Adulteration by means of potato flour may be detected by means of acids. Take a spoonful and pour upon it a little nitric acid; if the flour be of wheat, it will be changed to an orange yellow; if wholly of potato flour, the color would not be altered, but the flour formed into a tenacious jelly; if, therefore, the flour be adulterated with potato flour, it will not be difficult to decide. Again, take a spoonful of the flour, and pour upon it a little muriatic acid; if the flour be of pure wheat, it will be changed to a deep violet color, without odor; but if potato flour be mixed in it, it will then have an odor like that of rushes.—*Roller Mill.*

The Chinese Wall.

An American engineer, who has made the subject a special study on the spot, has calculated that the Chinese wall has a contents of eighteen million cubic meters (6,350 million cubic ft.) The cubic contents of the Great Pyramid is only 241,200 meters. The material used in the construction of the Chinese wall would be sufficient to build a wall round the globe 1·8 meters (6 ft.) high and 0·6 meter (2 ft.) thick. The same authority estimates the cost of the Chinese wall to be equal to the railway mileage of the United States (128,000 miles). The stupendous work was constructed in the comparatively short period of twenty years.

Engine Room at Ferguslie Mills, Paisley.

Our illustrations show views of the new engine room connected with the magnificent mills just completed at Ferguslie, near Paisley, for Messrs. J. & P. Coats, the well known thread manufacturers.

The erections which have just been completed are to supplement works which have been carried on successfully upward of a century, and mark a distinct development, not only in the production of thread and sewing cotton, but in the erection of premises and machines to produce the same.

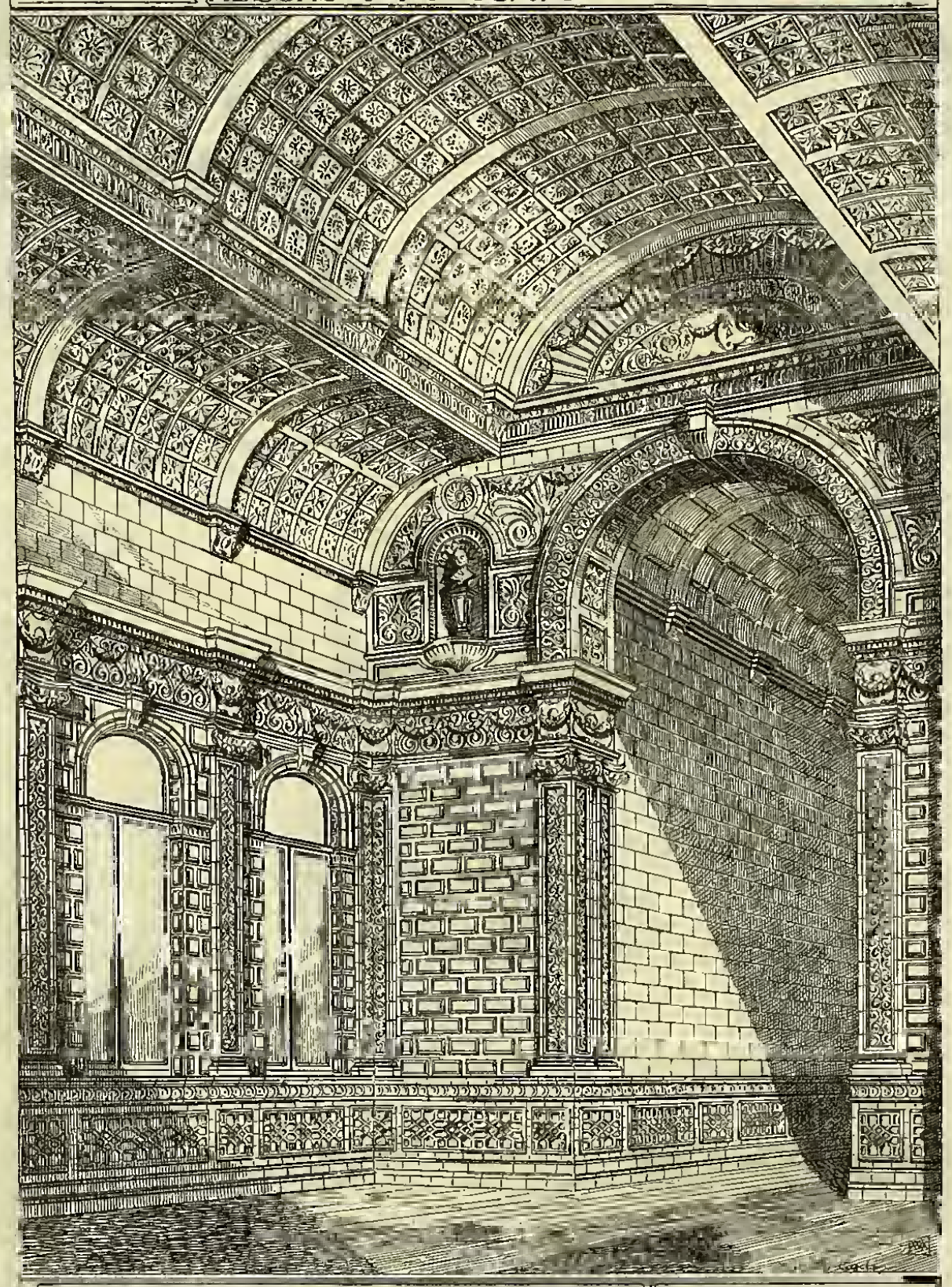
The mills just completed are probably the finest mills existing in the world, and Messrs. Coats have spared neither thought nor expense in carrying through the whole of the work in the most perfect and complete way possible. The new mill is 400 feet long by 130 feet wide, contains five floors, and is about 100 feet in height. An ornamental parapet is carried round the whole of the building, and is embellished with turrets at the angles, which are used for ventilating purposes, also by towers over the staircases. Below the base the structure is of stone, and above this point it is constructed of pressed brick.

The mill is lined throughout with glazed bricks, a dado of brown running through each room to a height of about five feet. The floors are in the best form of fire proof construction, being formed of wrought iron girders, and laid in cement concrete. Over this are laid ordinary floor boards, and over these again floors of half inch maple boards. The iron beams are all cased up with perforated zinc, and plastered. The columns are all incased with wire, and plastered. They have also ornamental moulded capitals, and the whole of the ceilings and ironwork are painted with enamel paint. The cleanliness, lightness, and general air of brightness and cheerfulness thus obtained is noteworthy, and forms a distinguishing feature of the salient points Messrs. Coats have had in view in their method of construction. Although the rooms are so wide, yet they are admirably lighted with natural light throughout, and in the absence of natural light, an ample provision of electric light is made.

Our illustrations refer to the engine house only, and it will at once be obvious that this is no ordinary structure. It is detached from the main building. The interior dimensions are 80 feet long, 40 feet wide, and about 80 feet high. The engines themselves are what are denominated compound tandem engines, of 1,500 horse power, the fly wheel being 35 feet in diameter, and having forty grooves for ropes, these ropes working on to pulleys in the main body of the mill, through the rope race.

The whole of the interior of the engine house is lined with Burmantofts faience, treated semi-constructionally, both the method of construction and the design being unique and specially adapted to give solidity and breadth of effect. The floor is laid in ceramic mosaic, the windows are of decorated glass, the window frames and all the woodwork being walnut and teak. The color scheme adopted throughout has been directed to secure thorough harmony of result. The dado is carried out mainly in browns and sage greens. The enriched band of the dado is treated in sage green and rich yellow brown, with the mouldings of deeper brown. The wall surface is a deep rich brown ivory in tone, and the effect of the rustication is considerably enhanced by the beautiful deeper tones of the color

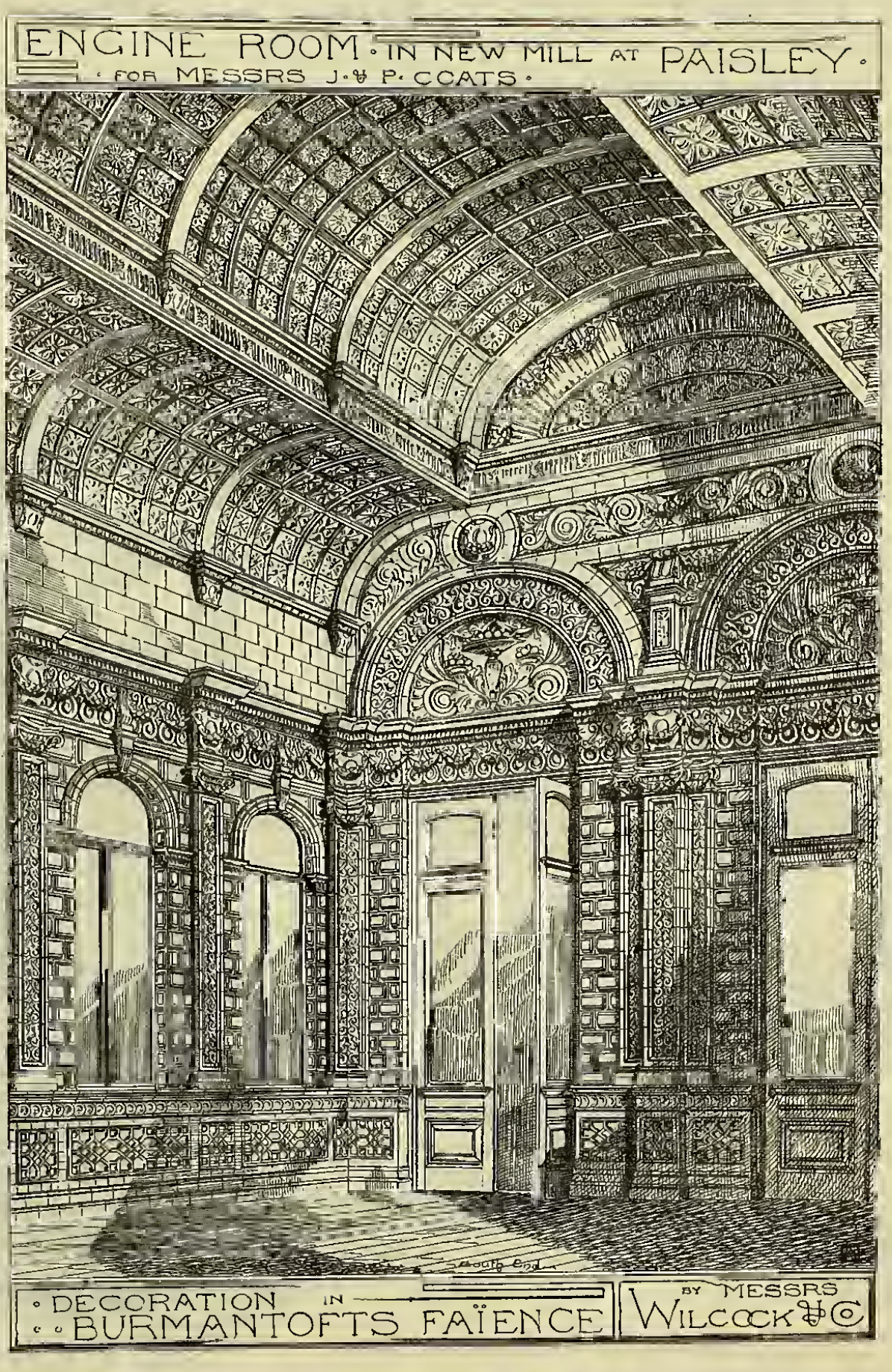
ENGINE ROOM IN NEW MILL AT PAISLEY.
FOR MESSRS J. & P. COATS.



DECORATION IN BURMANTOFTS FAÏENCE BY MESSRS WILCOCK & C°

developed by it. The mouldings of the pilasters are in rich teapot brown, the panels being picked out with yellow greens, yellows, and browns. The caps are picked out to harmonize with the pilasters, and the frieze, which is in strong relief, running all round the engine room, is freely treated in harmonious tints of yellow greens, brown, and yellow. The ashlar above the frieze is treated in pale yellow, with brown mouldings above and below. The corbels are also treated in brown. The general effect of the ceiling is a combination of brown mouldings and light tones of yellow in the panels. The mouldings of the ceiling are all in walnut, and the upper frieze band is in a quiet tone of faience. We are not aware that so elaborate an engine house has been erected in connection with any undertaking either in this or any other country, and, in adopting the use of Burmantofts faience, Messrs. Coats were actuated by the intention of having primarily a material essentially suitable in its cleanliness and durability, and, secondarily, of securing as complete an artistic result as could be secured, and so make their engine house not only a show place in the best sense, but one worthy of containing the magnificent engines which form the motive power for their new works.

The architects of the new mill and engine house are Messrs. Morley & Woodhouse, of Bradford and Bolton, and the Burmantofts faience has been supplied and fixed in their best style by Messrs. Wilcock & Co., of Burmantofts, Leeds, and may be taken as a favorable illustration of the successful application of their now well known specialty to a purpose outside the ordinary run of decoration, but a purpose for which it has proved itself to be most admirably adapted.—*The Architect.*



About Kerosene Oil.

Why does oil stink in use in the lamps? With the best oil that is made you can produce a gas in your house that will make the atmosphere as disagreeable as it is unhealthy. In all lamps where proper and complete combustion is maintained, there is no perceptible odor from any quality of oil sold in the market. But the trouble is, when people want to leave a house or a room for a time and keep a light burning, they turn down the wick. This is done for economy in most instances, but there is not only no economy in it, as I shall show you, but there is also a danger to health and life. Now, when you light a lamp, there is at first a time when the flame will not burn high without smoking; but after the lamp and chimney are properly heated, and a full supply of oil is established through the capillaries of the wick, a strong flame can be maintained. Now, if, with this supply established, we turn down the wick, owing to its decrease of burning surface, the supply of oil continues in the same ratio, what is not consumed in the flame being volatilized into gas, which is carried out with the ordinary products of combustion into the air of the room, vitiating it and making it very unhealthy to breathe. Now, here, in my opinion, is the basis of lamp explosions, and if the proper proportion of atmospheric air gets into a chimney, or is blown into it, an explosion is sure to result. In my opinion, most of the explosions of lamps, so called, occur by explosions in the chimneys. A lamp should never be turned down. It can be easily extinguished by blowing across the top of the chimney, and a very little practice will show that this is the easiest and best way. After blowing out, the wick should be turned down inside the tube, to prevent the oil flowing over. A close attention to the methods I have indicated will, I am sure, prevent most, if not all, the accidents from explosion of kerosene oil, and save many lives, as well as many thousands of dollars' worth of property every year.—*Boston Herald.*

A Confectioner's Building.

Mr. Charles F. Gunther, the confectioner, has for the past year been engaged in building a magnificent six story confectionery establishment, practically fireproof, and supplied with all modern improvements. The building is of unique and original design, and is located at No. 212 State Street, Chicago.

The interior decorations of this beautiful store have never been surpassed in this country, or, perhaps, in the world. Artistic design, pure taste and harmony in tone are all apparent, and the fact at once impresses itself on the eye and mind of the beholder. From the front or east door of the store the visitor looks down a broad vista to the grand staircase. The vision is unbroken. There is not a line or reflection to mar the beauty of the scene. The ceiling is an arched canopy of purely original design, and the coloring is of soft, warm lemon tints, relieved by glace blue. The motive of the ornament of the ceiling is the *acanthus leaf*, of which the panels and cornices are formed. The clustered lights, which are unique in design, are placed along the sides of the room, so that their rays are thrown directly across the ceiling, giving a most beautiful effect. This ceiling would do honor to the Vatican at Rome, so celebrated for its magnificent work of this kind.

The materials used in decorating are onyx, jasper, agate, and Lisbon marbles, and hand cut glass in all the delicate lemon shades.

The side wall of the room is ornamented with 2,000 feet of plate glass mirrors, so tastefully broken with brass lines and toned down by the soft colors of the surroundings that there is none of the loud or vulgar effect so frequently produced by this class of decoration. The harmony is so perfect that they simply serve to attract the visitor's attention by reflecting the beautiful lights of the ceiling, instead of blinding him with a blaze of garish light.

The grand staircase at the west end of the room and its magnificent stained glass window are also triumphs of artistic taste. The staircase leads to the upper floor of the building, and is not surpassed by anything in Paris, that city of grand staircases and regal magnificence. The steps are of the choicest rose colored marble, broad and low, with gold tinted and enameled panels and railings. On the sides are handsome Italian arches, draped in mottled silk plush, and on the newel posts large, polished brass figures hold tapers that, when lighted, add to the beauty of the scene. The staircase is illuminated by a magnificent stained glass window, containing 500 square feet of hand cut glass, with polished jewels, a most pleasing feature of this thoroughly artistic work. The broad flood of soft light that streams in through this window spreads far into the building, greatly enhancing the general effect. From the first landing of the stairs the visitor obtains a superb view of the store in all its exquisite beauty. This is the point of vantage, and it will unquestionably be sought by all who enter this novel place of business and who have an eye for beautiful effects. The vista is not dazzling in its brilliancy, but it is nevertheless brilliant. The massing of light and shade and the soft coloring stand out prominently and make the view one of surpassing loveliness.

The furnishing of the store is in full keeping with the adornment. The upholstering is of rich silk velvet, and the shelves and cases of the neatest and most convenient kind.—*Conf. and Baker.*

A Waterproofing Process for Stone.

A waterproofing process for application to stones and mortars has been introduced by Messrs. Faure, Kessler & Co., under the name of "fluatation," and is favorably mentioned in the *Genie Civil.* The process consists in the application to stones, either before or after use in building, of various preparations of hydro-fluosilicates.

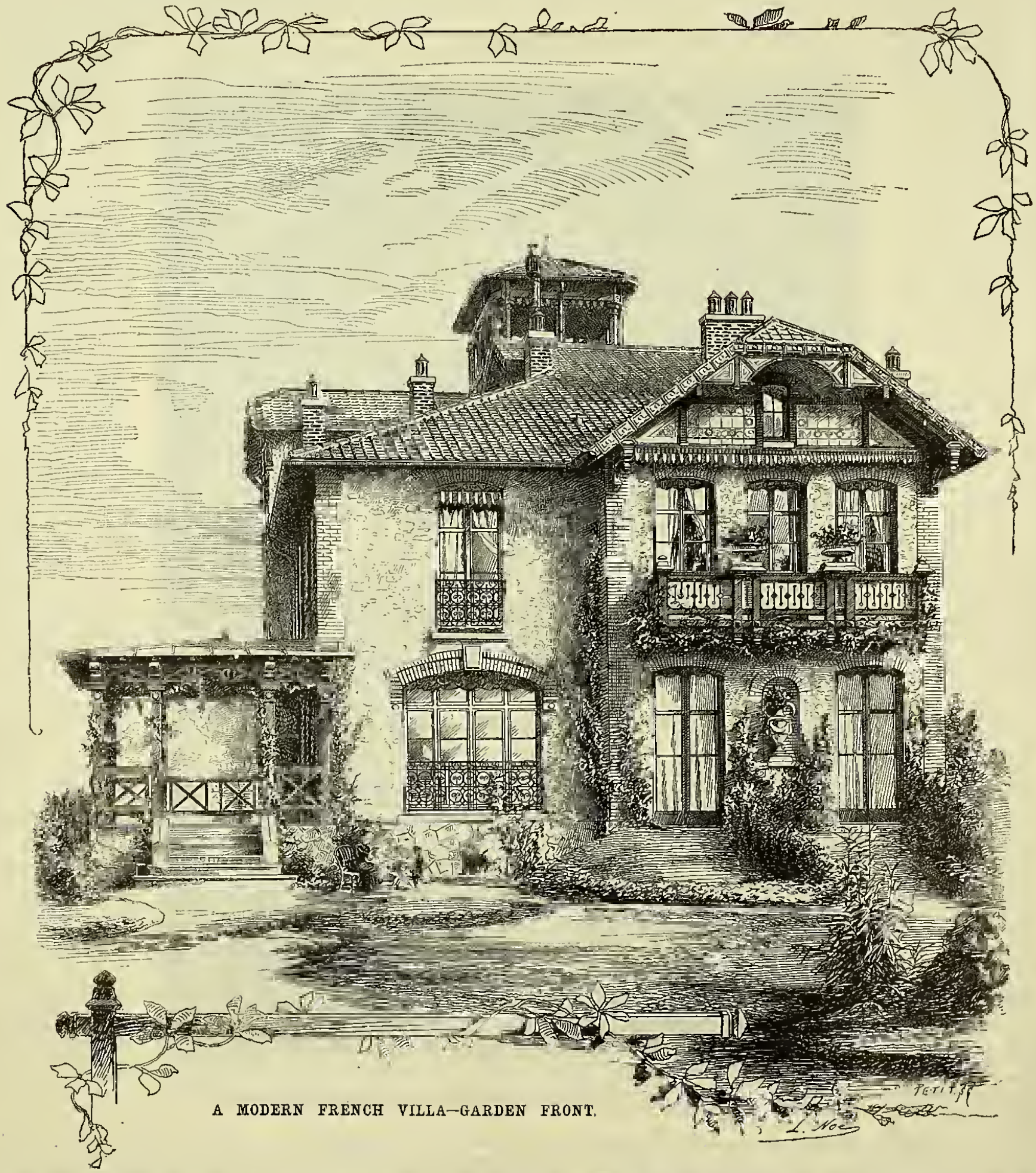
The operation is said to be very simple, consisting in the application of the solution by means of a brush, sponge, or hand pump. Three coats are put on during as many successive days, and the result is to make the stone and mortar as hard as the finest marble. Several preparations are made for special purposes, but they all harden limestone. One darkens the stone, another bleaches it, another preserves the original color, while others again are made the medium of staining the stone indelibly. "Fluatation" may be applied to old structures as well as to new buildings, and is preservative to a greater degree than any other known process. Reservoirs, baths, and other structures requiring to be water-tight can be made of stone so treated, and no ordinary liquids attack the preservative coating. Any stone, mortar, or cement may be "fluated," provided it is more or less calcareous.

A FRENCH VILLA AT ENGHIEN-LES-BAINS, FRANCE.

Our illustrations are from *La Semaine des Constructeurs*, a weekly architectural French publication of acknowledged ability.

This villa was recently constructed at Enghien-les-Bains, upon the plans and under the direction of M. Friese, and is an example of the originality permitted and suitable for the country where located.

The foundation is of concrete, and the walls are of the same construction, but with stone work exposed, openings faced with brick, sills and lintels of cut stone.



A MODERN FRENCH VILLA—GARDEN FRONT.

The wood finish is of chestnut. Roof covering of tiles.

The cost of construction was:

Grading, mason work, and paving	$6,000
Wood work	1,900
Iron work	1,880
Plumbing and roofing	2,800
Painting and glazing	1,000
Chimneys	400
Furnace	400
Decoration	320
	$14,700

Oil stains may be removed from paper by applying pipe clay powdered and mixed with water to the thickness of cream; leave on for four hours.

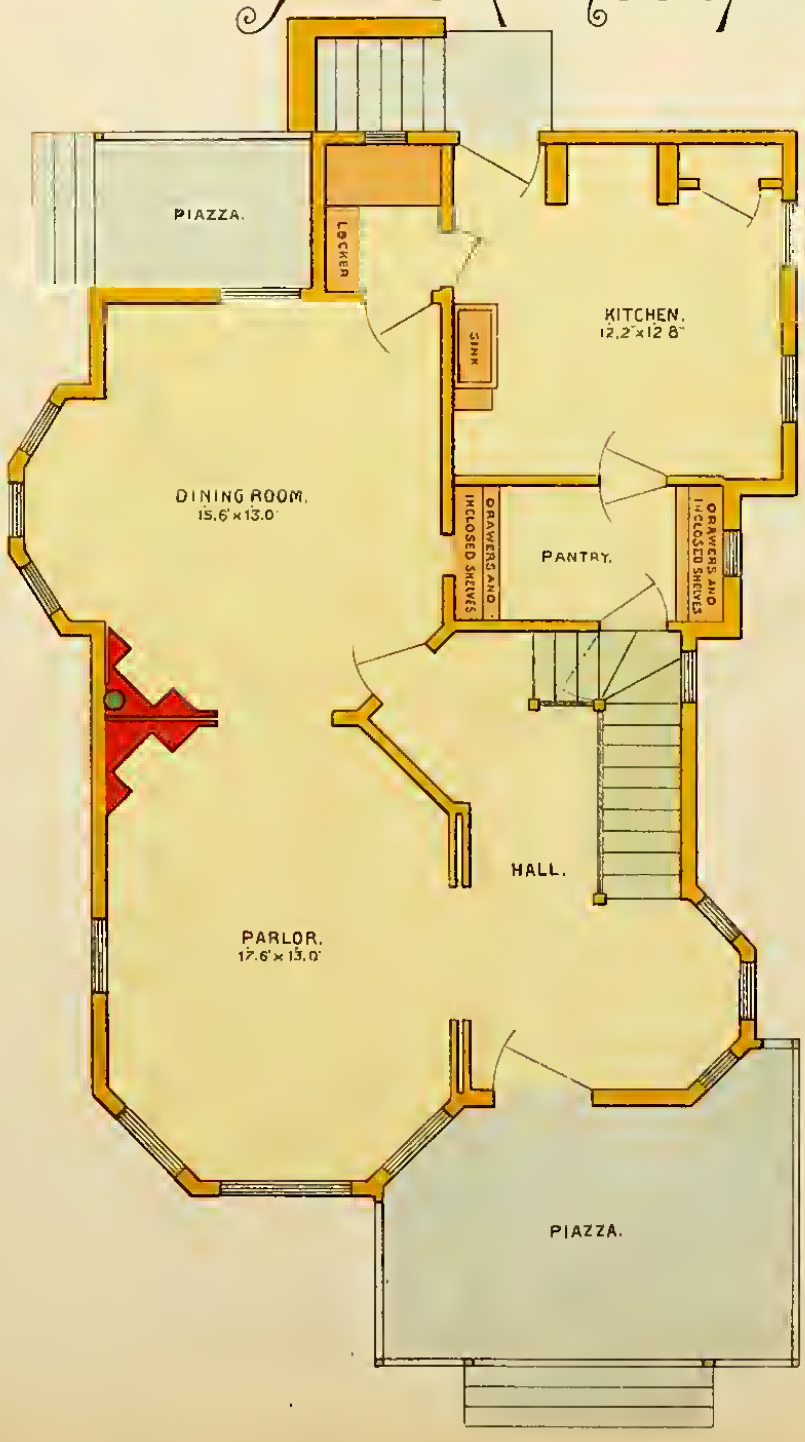
Paper Car Wheels.

The following particulars were recently given in *Harper's Magazine*:

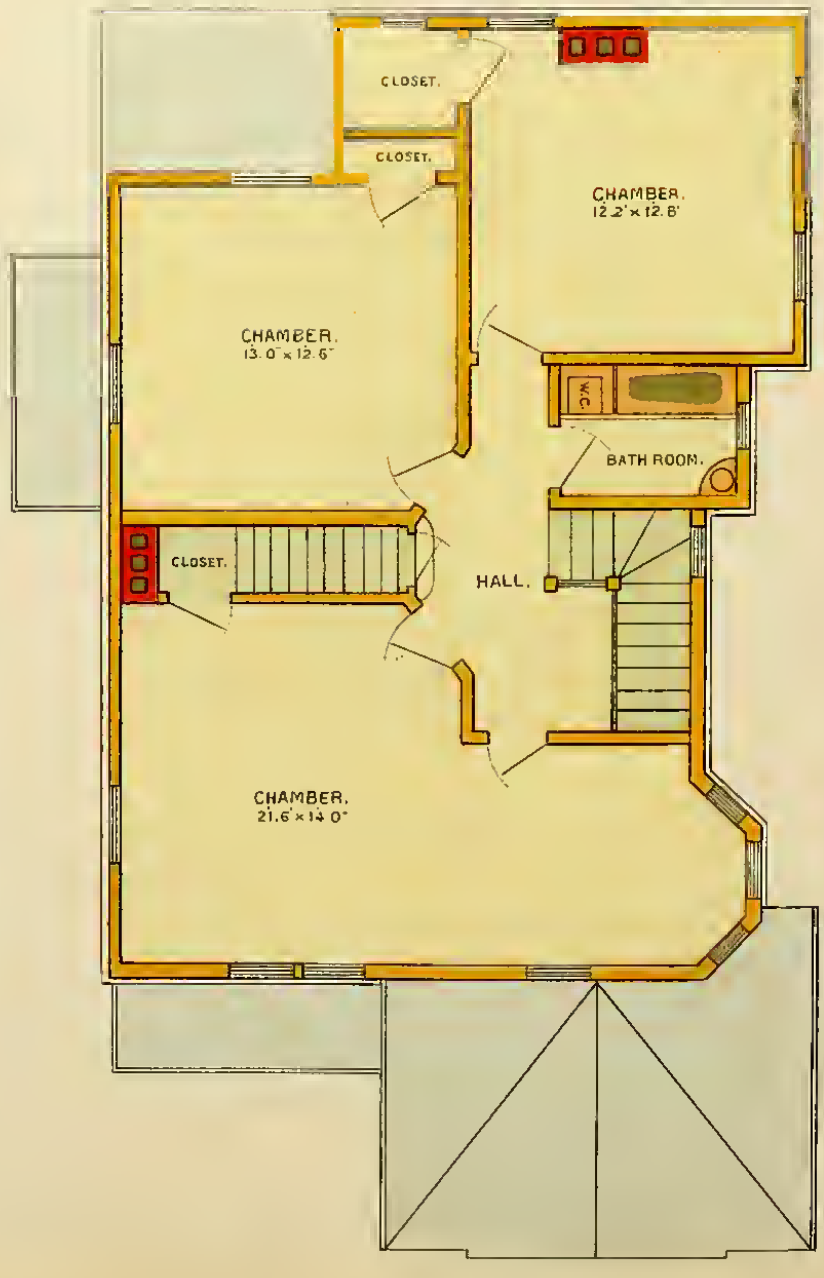
The paper car wheel was the invention of Richard N. Allen, a locomotive engineer, afterward master mechanic of the Cleveland & Toledo Railroad, who took for his aim in life the production of a better car wheel than those in use. His first set of paper wheels was made in Brandon, Vt., in 1869, and after much scoffing he was graciously permitted the use of a wood car on the Central Vermont road, under which they were tested for six months. The Pullman Palace Car Company, in 1871, gave the first order for 100 wheels; ten years after, the Allen Paper Car Wheel Company, with great shops at Hudson, N. Y., and Pullman, Ill., produced and sold 13,000 in a single year. One of the set first experimented with under a "sleeper" is shown at Hudson, with a record of 300,000 miles travel. It is the body of the wheel only which is of paper. The material is a calendered rye straw "board," or thick paper, made at the Allen Company's mills, at Morris, Ill. This is sent to the works in circular sheets of 22 to 40 inches diameter. Two men, standing by a pile of these, rapidly brush over each sheet an even coating of flour paste, until a dozen are pasted into a layer. A third man transfers these layers to a hydraulic press, where a pressure of 500 tons or more is applied to a pile of them, the layers being kept distinct by the absence of paste between the outer sheets. After solidifying under this pressure for two hours, the 12-sheet layers are kept for a week in a drying room heated to 120° Fahr. Several of these layers are in turn pasted together, pressed, and dried for a second week, and still again these disks are pasted, pressed, and given a third drying of a whole month. The result is a circular block, containing from 120 to 160 sheets of the original paper, compressed to 5½ or 4½ inches in thickness, and of a solidity, density, and weight suggesting metal rather than fiber. The rough paper blocks are turned accurately in a lathe, when shavings like leather and a cloud of yellow dust fly off, to a diameter slightly greater than the inner circle of the tire. The hole in the center is also made on the lathe, and after the paper has received two coats of paint to prevent moisture working its way within, the cast iron hub is pressed through by the aid of the hydraulic press, and the wrought iron back plate is clamped on. The suasion of enormous hydraulic power now drives the paper center into the tire by help of the bevel.

Hemlock laths are not to be despised. In the West they are hated by the carpenters because their slivers have a sting, and nails do not puncture them easily. But hemlock laths are making their way against prejudice. A White Lake, Mich., concern has this year handled 1,500,000 hemlock laths, shipping them to Indiana points. They are straight grained and clear of knots, and give good satisfaction.

A FOUR THOUSAND DOLLAR COTTAGE.

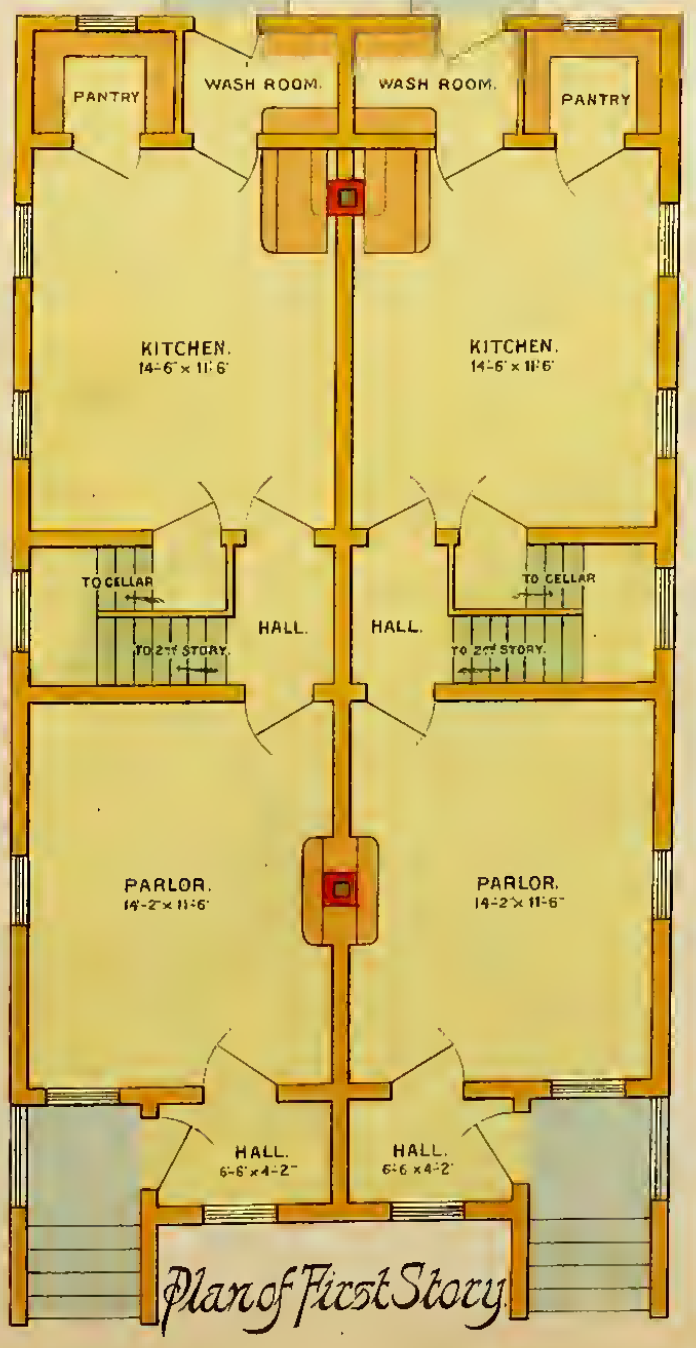


Plan of First Story.

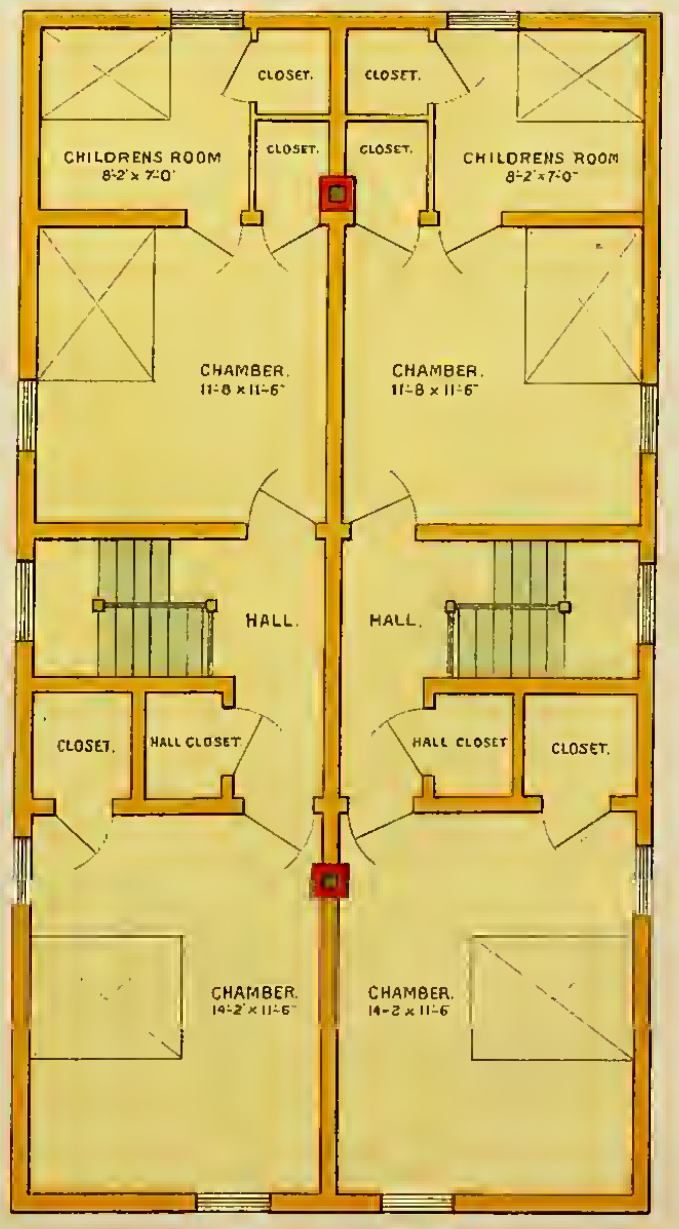


Plan of Second Story.

A Fourteen hundred Dollar Double house.



Plan of First Story.



Plan of Second Story.

SCHUMACHER & ETTLINGER, NEW YORK.

Blistering.

The season is at hand when our semi-tropical weather makes everything fairly smoke. The sun's beams glance down upon us, and sap all life and activity from our bones. So great and intense is the heat, that at times both man and beast are prostrated unto death.

Is it any wonder that so soft a material as varnish should be heated to the point to raise into blisters, when a carriage stands for hours exposed to both direct rays and reflection from the pavement?

And the higher the grade of varnish, the more liable is it to be raised into blisters, for its very elasticity is its weakness under great heat. Work painted during the winter, and that has had plenty of time to harden, is pretty secure from blistering. It is the carriages that were finished late in the spring that need most careful guarding. That heat will raise varnish into blisters is proved by using flame to remove the old paint from any painted surface.

If there is any oil left, it will manifest itself by expanding into a gaseous form, and as it cannot readily escape, it forces the resistant outer skin into sacs.

Blisters are caused by heat of greater or less intensity. Even in the case of blistering caused by poor japan or other material there is a chemical change, a burning which causes the paint to rise up in patches. Our flesh blisters under the action of both natural and artificial heat and through fever. It will be seen, then, that a blister cannot be made unless by confined vapor or gas in an aeriform state, produced by heat. Moisture or the sap in wood will cause blistering when the surface is heated sufficiently to penetrate and cause evaporation. It is foolish to say that it is impossible because water does not boil and form steam below 212° Fahr. Damp boards gives off vapor under an early morning sun, and the same will occur whenever the dampness is small in quantity. Oil does not boil under 400° or 500°, but it does not take a degree of solar heat above 80° or 90° to cause soft varnish to raise into blisters, when long exposed. We remember, when a boy, seeing the paint on steamboats that ran from Cincinnati to New Orleans badly blistered, and the degree of heat that caused it was not much above 100°.

Paints containing little or no oil when laid over thoroughly dry wood seldom blister, for there is nothing for the heat to vaporize.

Some wonder why it is that a panel or panels will blister in a few places instead of over the entire surface exposed. The same is true under the effect of a burning iron surface or flame, which is probably due to the fact that the vapor is drawn from the parts adjoining the blisters and concentrates in them. A blister here and there on a panel shows that the conditions of the under surface were more favorable to evaporation at those places. Painting that is allowed time to harden thoroughly between coats, and that contains excellent material, is well nigh proof against blistering.

Sometimes the roof of a coach will blister in spots, which may be caused by drops of water, which act as lenses to concentrate the heat in those spots.

Grease in spots that have been painted over is another cause of blistering. The parts of a carriage that are never exposed to the direct rays of the sun do not blister, and an under panel standing at an angle is proof against blistering, except when it is exposed to reflected heat from the pavement. Blisters are more unsightly than cracks, because the former rise above the surface, and are more distinctly visible, and are less easy to hide; for when they are removed they leave round patches lower than the level of the varnish, which require to be putttied and retouched with color for buried work, and to thoroughly remove them, the paint must he burnt off. A few blisters may he corrected by pricking them and pressing the varnish back to the level; that is, when the operation is performed at once, for when the sac hardens it will shell off.

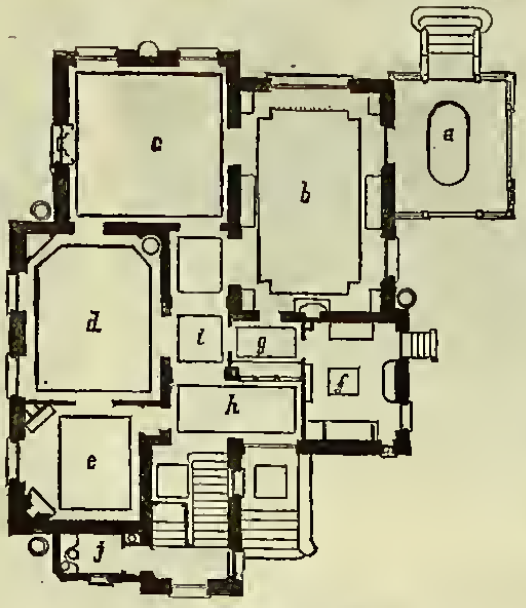


Fig. 1.—GROUND FLOOR.

a. Veranda, *b.* Dining Room. *c.* Parlor. *d.* Billiard-Room. *e.* Sitting Room. *f.* Kitchen. *g.* Office or Waiting Room. *h, i.* Halls. *j.* Water Closet.

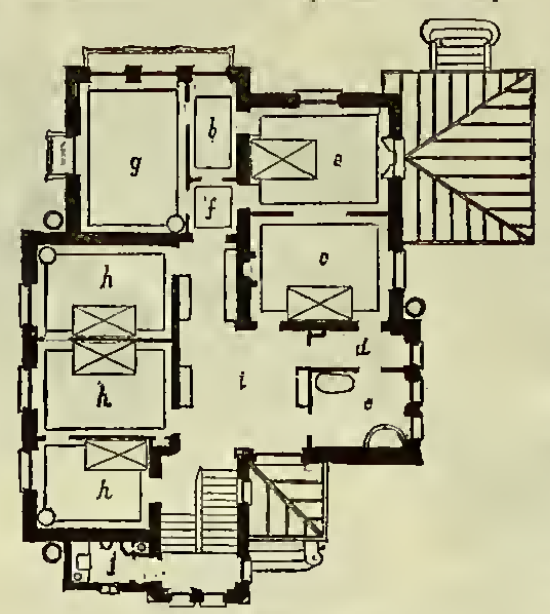


Fig. 2.—SECOND FLOOR.

a, Chamber. *b,* Dressing Room. *c.* Chamber. *d.* Dressing Room. *e,* Bath Room. *f.* Hall. *g.* Office or Workroom. *h h h.* Chambers. *i.* Hall. *j.* Water Closet.

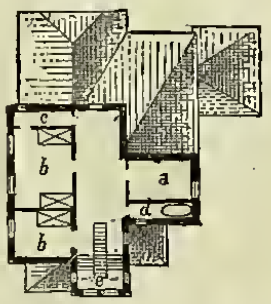
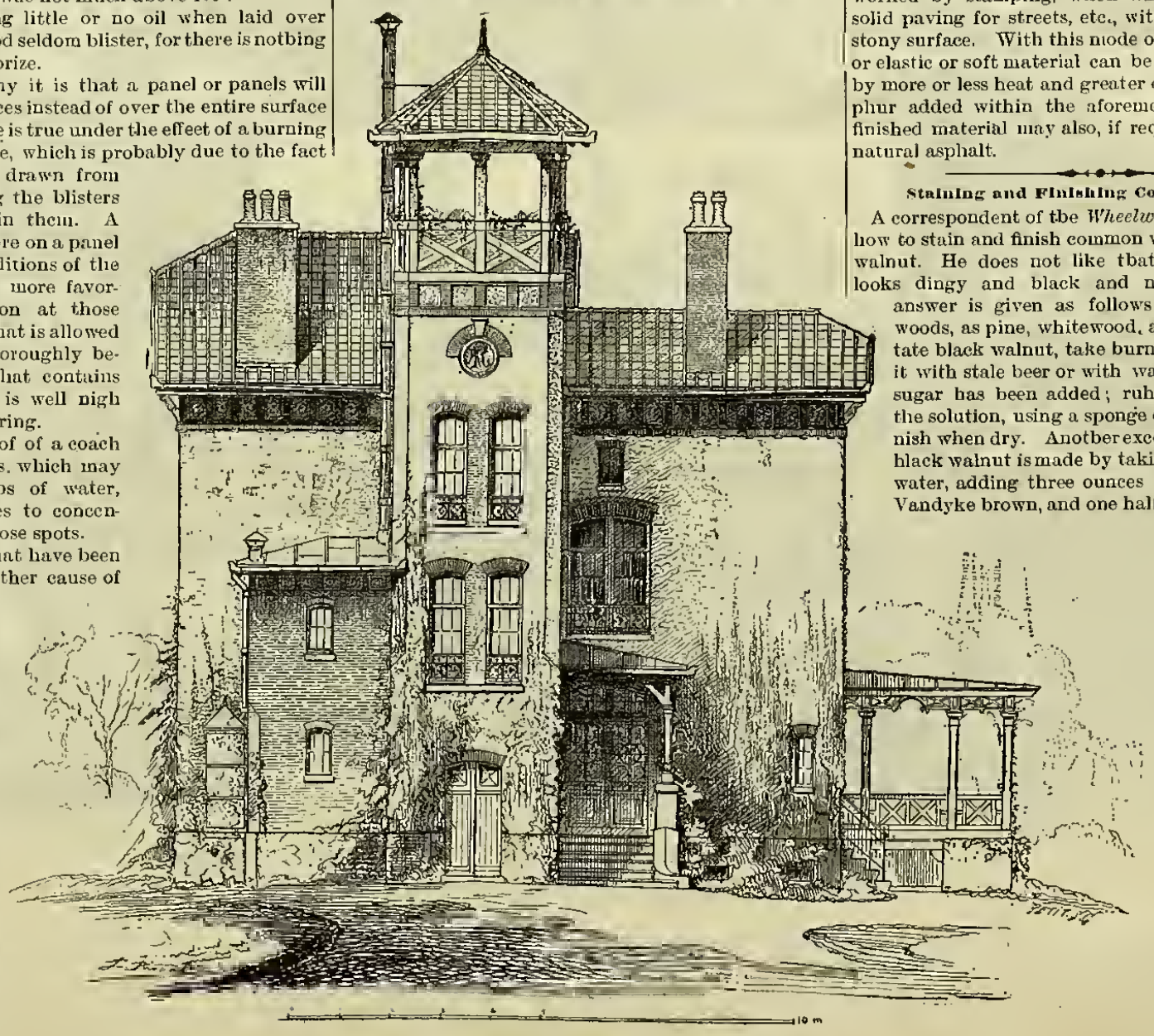


Fig. 3.—THIRD FLOOR.

a. Workroom. *b b.* Chambers. *c.* Closet. *d.* Water Tank. *e.* Stairs to Cupola.

Fig. 4.—ROOF.

When the wood is free from moisture, either inherent or absorbed from the atmosphere just before the priming is applied, and the under painting is bone dry, the liability to blistering is removed to the last coat of varnish.—*Painters' Magazine and Coach Painter.*



A MODERN FRENCH VILLA—PRINCIPAL FRONT.

Artificial Asphalt.

Natural asphalt has generally hitherto been used for paving and other purposes, being either employed alone or mixed with more or less limestone, sand, or other substance, according to its quality and the amount of bitumen in it. An asphalt has also been produced by mixing pure natural bitumen with limestone. The improved process of Dr. Paul Jeserich, of Berlin, dispenses, it is said, with natural asphalt or natural bitumen, and consists in the production of a material having the necessary qualities of the natural asphalt. The artificial asphalt is thus produced: Tar or other semi-liquid or viscid hydrocarbons with a high boiling point are heated in an iron boiler, if possible, with indirect firing, to a temperature of 130 to 200 degrees Centigrade, at which the material is maintained. Meanwhile sulphur is added by degrees in small quantities, according to the nature of the hydrocarhon employed, the sulphur being in proportion of about 5 to 20 per cent. of the hydrocarhon. The less volatile the hydrocarbons are, and the higher their boiling point, the less is the percentage of sulphur required. The sulphur dissolves in the hot liquid hydrocarbon with a powerful reaction and energetic evolution of sulphide of hydrogen and other sulphides.

After the reaction is finished, and the mass has obtained a consistence which is somewhat more fluid than the natural asphalt, it is transferred, while warm, into a mixing apparatus, and thoroughly mixed therein, under continuous agitation, with pulverized limestone, silicate, or the like. About 75 to 94 per cent. of pulverized stony material are required therefor. The product thus obtained is transferred to a kiln, where it is dried at a temperature of about 120 to 150 Centigrade, with frequent movement and turning over of the material, for half an hour to one and a half hours, according to the quantity of material and the proportions of mixture. The mixing apparatus may be so constructed as to be adapted to he heated, and therefore to serve at the same time as a drying apparatus. The powder obtained by drying has the qualities and appearance of natural asphalt, and may be easily worked by stamping, when warm, for producing a solid paving for streets, etc., with a thoroughly hard, stony surface. With this mode of manufacture a hard or elastic or soft material can be obtained at pleasure by more or less heat and greater or less amount of sulphur added within the aforementioned limits. The finished material may also, if required, be mixed with natural asphalt.

Staining and Finishing Common Woods.

A correspondent of the *Wheelwright* desires to know how to stain and finish common woods in imitation of walnut. He does not like that kind of work, but it looks dingy and black and not at all nice. The answer is given as follows: To stain common woods, as pine, whitewood, asb, oak, etc., to imitate black walnut, take burnt dry umber and mix it with stale beer or with water to which a little sugar has been added; rub the wood over with the solution, using a sponge or rag, and then varnish when dry. Another excellent stain to imitate black walnut is made by taking two quarts of rain water, adding three ounces sal-soda, four ounces Vandyke brown, and one half ounce bichromate of potassa, and boiling the mixture for fifteen or twenty minutes. It can be applied with either a brush or sponge. When dry, varnish (hot or cold). Woods that are stained will finish up nicely if the first coat of varnish be a shellac varnish, which, being a spirit varnish, assimilates better with the stain coat and enriches it. It also prevents the copal finishing or rubbing varnishes from striking in.

THE COLLEGE OF THE CITY OF NEW YORK—THE TECHNICAL COURSE.

The tendency of modern educators is every day more directed in the way of manual training. The first steps in children's education by the kindergarten method of Froebel, and the followers and amplifiers of his system, consist in a training of the faculties of observation and manual accomplishment. It is claimed that by this system a child need only commence to learn to read when seven or eight years of age, and that, owing to his kindergarten training, he will pass by one who may have learned reading several years earlier, but who never had a regular course of object lessons. The object system being established as a foundation for educational training, the extension of the same system to the higher courses seems only logical. A strong movement to effect this has become prominent here and in other cities during the past year. In New York the project of establishing such classes in the public schools has been successfully carried out. Considerable notice has been taken of the attempts. The work of the students has been publicly exhibited, and commented on in the papers. While this has been going on in the grammar schools, and before this period, the College of the City of New York has unobtrusively, and without attracting any notice, carried out a similar advance. Manual and technical education is firmly established there. From blacksmithing and carpentry up to chemistry and physics, the leading branches of technical training have a place in the course.

The president of the college, General Alexander H. Webb, saw from an early period the necessity in a college course of making men think for themselves. Thus, to render the lectures in ancient art and history concrete, reference could be made by the professor to the college collection of pictures and models. If the Venus Victrix or Apollo Belvedere was spoken of, a picture or cast of the statue was at hand for illustration. Athens

THE COLLEGE OF THE CITY OF NEW YORK—THE TECHNICAL COURSES.

1. Microscopy. 2. Chemical Laboratory. 3. Blowpiping. 4. Wood Lathe. 5. View of College. 6. Iron Lathe. 7. Physical Laboratory. 8. Drawing Room. 9. Melloni's Apparatus. 10. Blacksmith Shop. 11. Carpenter Shop.

and its Acropolis became more than names when the views of the city and its buildings were presented to the student. The courses in chemistry and physics, from the beginning of the college, were profusely illustrated by the experiments of Professor Doremus, who, in his reputation of a demonstrator, is without rival in this country. Thus the eye has always been appealed to as well as the purely intellectual faculties, and this was the beginning of the advance. Within a few years the practical lessons of the laboratory, workshop, and drawing room have been added and made a part of the course. Some views of these are given in our illustrations.

The main college building is familiar to all residents of our city. It is situated on the southeast corner of Lexington Avenue and 23d Street. South of it a new building, devoted principally to the natural history department, was erected some years ago, and more recently a building devoted to the technical work of the students was erected to the east of the main building. These new departments are the ones illustrated in this issue.

Recognizing the practical, every-day importance of the microscope, the students are instructed in its use. The substances examined by it are principally commercial products. The obvious intention is to give the students a lesson that may be of service in business life, where these products are dealt in. The same is to be said for the blowpipe class, where mineralogy and examination of ores is studied. The construction of the blowpipe from a clay pipe, a cork, and a bit of glass tube will be familiar to some, but probably new to the greater number of our readers. These branches are in the charge of Prof. William Stratford.

For the study of practical and analytical chemistry a laboratory that in many respects is superior to any in the city is provided. The ceiling is very high, and rises in a series of parallel gables running east and west and glazed upon the north slope. These act as a series of skylights, admitting the north light only, and excluding all direct sun light. The effect is the most perfect illumination for work. The room is filled with laboratory tables, each table having its own set of reagent bottles, with name and symbol blown upon the glass of each. At the end of the room is an elevated platform, with lecture table and blackboard, for the use of the professor or instructor in charge of the laboratory. Various details about the desks are worthy of notice. No separate funnel or filtering stands are used, a series of sockets being provided that hold movable supports for the funnel. For every four desks a sink and water faucets are supplied, a distinct advance upon the old system of a single sink for a whole laboratory. Qualitative analysis is taught here; quantitative analysis as yet being given to but few of the students. Balances are, however, provided, so that the laboratory is equipped for both classes of work.

Physical science, as a rule more quickly appreciated by students than chemistry, is practically studied in laboratories devoted to it. Air pumps, gas analysis apparatus, electrical apparatus, gasometers, apparatus for illustration of heat and light, are here all used and handled by the students themselves. Radiant energy is worked at by sections of four or five students at a time with Melloni's classic apparatus. Those who have attended a good course of lectures in physics may form some idea of the work when it is stated that practically the students themselves repeat all the experiments incident to such a course.

Prof. Doremus, in whose charge these two departments are, lectures on the subjects of chemistry and physics, with all the illustrations the college's collections afford. His lecture room, as not appertaining to the students' personal work, is not shown. It is provided with every imaginable appliance, including the great air pump driven by steam.

The practical division, including the laboratories, is directed by Dr. Charles A. Doremus, together with Dr. L. H. Friedburg. The work of inspiring an army of students day in and day out with the magnetism necessary for their work is a most trying one, as any educator can testify. Upon the work of the laboratories, and upon this inspiration, the success of the course depends.

The instruction in drawing on the blackboard, and on paper from relief models, and from memory, is a necessary feature of the programme. Besides relief models, natural history is made to supply subjects. On the boards the structure of mollusks and other types are drawn. In this way the art may be made the exponent of a branch of natural history, and by such reference acquire a new spirit of life and reality.

What we have thus far described is the work in the natural sciences. Practical and useful though the design is, a more striking, because on its face a lower and more every day, form of manual training is next to be considered. In an extensive workshop, wood and metal working are thoroughly taught. Some of the scenes are illustrated.

The treatment of iron begins with forging. The general principles of the art are given by the instructor, with blackboard illustrations. The students then don their aprons, light up their own fires, and in groups work at the assigned tasks. A number of portable forges with hand blowers keep all the students at work. On the occasion of our visit, all the class were occupied chain making. Another day, some other piece of forging would be executed. In this way a knowledge of this most artistic work is acquired. In no art can effects more characteristic of the pure work of the hand be produced. The achievements of the old time blacksmiths in decorative forgings can stand comparison with the work of any artificers.

The blacksmith shop is next to the lathe or turning shop. Here a large number of lathes for metal turning, both speed and engine lathes, are in daily use. Having learned how to forge his material, and acquired some idea of vise work, filing, etc., the final work of turning is taught. From our illustrations, owing to limited space, only an imperfect idea of the number of lathes and completeness of the equipment can be obtained. Between the lathe shop and blacksmith shop is an electric plant for supplying electricity for the general needs of the scientific department.

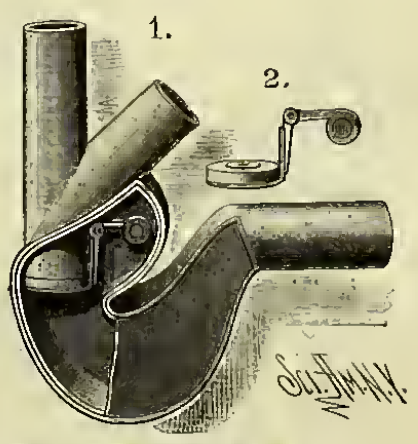
Next to the metal turning lathes come the wood lathes. There are about the same number of these. The students who have gone through the carpenter shop, and have learned joinery, are ready for wood turning. All the lathes are driven by power.

Finally, the carpenter shop is shown. A number of complete benches, with full outfit of tools, give every facility for good work. In this connection the subject of sharp tools is not lost sight of. The students receive special instruction in sharpening their saws, plane irons, etc. For the lessons in saw filing, strips of brass are supplied, which the student files into teeth for practice. This economizes material, and really affords, if anything, a better substance for a criterion of the student's work. The making of the different joints, such as mortise and tenon and dovetail, with other points in carpentry, are features of this course.

Thus it will be seen that the city of New York affords to the sons of her citizens a complete technical training free of all expense. With great judgment the students are not restricted to the regular hours for work in the shops. Late in the afternoon they may be seen bending over the lathes, or carpentering, or doing some other class of work. Yet we believe we risk little in saying that we are disclosing what is to many a new fact—the existence of such an opportunity for the poorest as well as the richest of the city's future citizens. The work of the college has been done so quietly and unostentatiously that less is known of it than should be.

PLUMBER'S TRAP.

The annexed engraving represents an improved plumber's trap, especially designed to prevent sewer gas from entering the house through the waste pipe. The horizontal waste pipe extends from one arm of the D-trap, while the vertical main outlet pipe enters the other arm. From near the end of the outlet pipe extends a branch overflow pipe. One side of the trap is closed by a plate which may be removed for clearing the trap or repairing the valve. The upper part of the trap, where it connects with the waste pipe, is on a higher level than the lower end of the outlet pipe, which is, therefore, always water sealed. The trap is formed with an upper chamber, within which the valve is placed. The valve proper, Fig. 2, is composed of a plate bent at right angles. Secured upon the upper surface of the lower portion is a packing of leather or other soft material to form a tight joint with the lower end of the outlet pipe when the valve is closed. The upper portion of the plate is connected to the



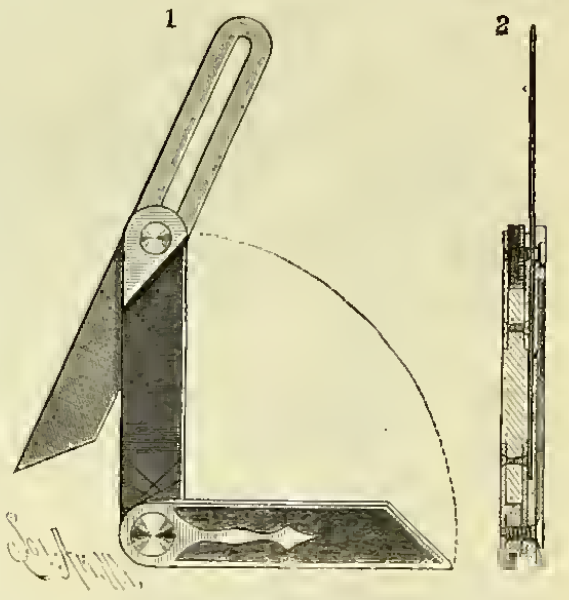
GERSTENBERG'S PLUMBER'S TRAP.

lower arm of a bell crank, through the angle of which the valve is pivoted to a stud projecting from one side of the chamber. The other arm of the bell crank is provided with a weight which overbalances the lower part of the valve, so that the latter will close automatically when the water stops flowing from the main outlet or overflow pipe. Any gas that may find its way through the water retained in the trap will be prevented from entering the outlet pipe, and any pressure that might result from accumulated gas in the trap would only serve to force the valve more firmly against the end of the pipe.

All further particulars concerning the invention may be obtained from the patentee, Mr. F. C. Gerstenberg, of 1107 First Avenue, New York City.

IMPROVED BEVEL.

Upon each side of the body at the ends is secured a brass plate having a circular projecting portion. The plates upon one side are formed with circular apertures centrally made in the projecting portions, while the plates upon the opposite side are formed with square



WITTER'S IMPROVED BEVEL.

apertures. Pivoted upon a screw bolt passing through these apertures are the two blades, shaped as shown in Fig. 1; Fig. 2 being a sectional view, showing the blades folded in suitable recesses provided in the body. Each bolt is provided with a circular thumb nut, having milled edges and a groove cut centrally around its edge to facilitate turning. The nuts may be further tightened by means of a nail set inserted in a hole made in their edges. The blades will be securely held in any desired position by these nuts. Near the pivotal point of the short blade, the top plate of the body is provided with gauge lines, to which the blade may be adjusted when it is desired to cut on a square or at an angle. The short blade is especially useful in working from plans, as both blade and handle are brought close thereto. Then, as the bevel is turned over to mark the wood, the thicker part of the handle is brought against the board to be cut. By the use of two blades in combination, almost any angle may be obtained, and in cutting hips, valleys, and jack rafters the small top blade will be found especially useful. It will be seen that the means for tightening the blades are entirely out of the way, and not liable, therefore, to form an obstruction in handling the tool or become broken or disarranged from a fall.

This invention has been patented by Mr. Frank E. Witter, of Brooklyn, Conn.

Naval Architecture During the Last Half Century.

The annual lecture under the auspices of the Greenock Philosophical Society, to commemorate the birth of James Watt, was delivered in the Watt Lecture Hall, Greenock, on January 14, by Mr. Robert Duncan, shipbuilder, Port Glasgow. The title of Mr. Duncan's paper was "Evolution in Naval Architecture during the Reign of Queen Victoria." After referring to the early history of marine engineering, and to the intimate connection of Greenock and the Clyde with its initial stages, Mr. Duncan went on to say that up to the date of her Majesty's accession in 1837, no systematic attempt at ocean navigation by steam had been made. In 1812 steamship building began, but it was not till 1838 that the first Atlantic steam communication began. The Sirius and the Great Western made the voyage to and from New York at the same time, in the middle of that year, in fourteen and seventeen days respectively, under steam all the way. Mr. Duncan then traced rapidly the evolution of the iron ship, through the various modifications of design and proportion, and the simultaneous and consequent evolution of crafts to adapt themselves to the rapidly changing conditions. Mr. Duncan also described the influence upon the forms of ships of maritime law and of Lloyd's rules—evolution in size from the short square boxes of the early periods to the long narrow vessels of to-day; the Enterprise, for example, the first steamer to make the voyage to India by the Cape of Good Hope, being only 122 feet long, while now the cargo carrrying steamer is over 400 feet long, and the express passenger ocean steamer over 500 feet. Mr. Duncan considers it possible that, ere her Majesty's reign closes, the Flying Scotchman of the sea will reach a length of 800 feet, and a speed of twenty-five to thirty miles an hour. The evolution of the man-of-war was next described, an interesting sketch given of the science of naval architecture, and a bibliography of the subject.

Best Effects in Paper.

Many of our subscribers have asked us to reprint our article on the best effects in papers, and in accordance with their desire we herewith insert it.

"*Bedrooms.*—Small-figured light paper touched with gold, and a border not too dark for the walls. For the ceiling, a single point, or a delicate tint with small figure. If stile and decoration are used, the effect is better to match the color of the decoration and side wall border as closely as possible. The stile may be a trifle darker than the center.

"*Dining Room.*—Linerusta Walton, leather, or, if something cheaper is desired, some imitations of these are very good. This room can bear and will be improved by a much heavier finish than most others. Paneled ceilings, with corners or squares containing game or fruit pieces, trimmed with binders, or wood mouldings, are handsome and popular. A well covered center is serviceable for the ceiling. If a dark carpet is used, the paper should be at least three shades lighter. Never put on a Pompeiian shade of paper with a bright red or maroon ground carpet, as one color kills the other.

"*Library.*—The most *recherche* style for this 'heart of the house' is Pompeiian red paper with frieze of gold or yellow figures, and copper moulding for hanging pictures under it. A ceiling with center of light buff, stile of mustard yellow, decoration of Pompeiian red, or blue and gilt, with figures of the opposite color on it, cornice in tints of Pompeiian red, yellow, mustard and blue.

"*Hall.*—The prettiest and most desirable papers now in use for our halls are geometrical figures in light colors and gilt. A very popular shade nowadays is called 'biscuit (just the color we like to see our soda biscuits as they come smoking from the oven). It is used with a frieze of flowers, or a Persian design, matching the side wall in color.

"*Parlor.*—This, of course, is the best room in the house, usually, and should have the best paper, and your customers, no doubt, will be more particular with this than any other room.

"A good plan is to go by the woodwork, as, for instance:

"*Maple Wood.*—Use a yellow, ivory colored paper, with a ceiling paper of bluish tint and a little gilt.

"*Cherry, Natural or Colored.*—Advise your customers to use old gold paper or 'metals' for side wall, and blue or white ceiling.

"*Mahogany.*—A light terra cotta pink for side wall, and a paper for ceiling with a light silver green metal in it.

"These suggestions are the proper thing for the parlor, as in this room, especially, the colors should harmonize.

"One very important thing in this room is a frieze, as it bears the same relation to a side wall as a cornice does to a house. It should give dignity to a room, and should be wide enough to admit of ornament that will not seem cramped or insignificant when seen from the floor.

"If the ceiling is nine feet high, use a frieze of eight or nine inches wide; if ten and one-half or eleven feet, you can use a frieze of fifteen or eighteen inches in width. Do not use a conventional design above a wall paper whose pattern is flowered, or *vice versa*.

"*Kitchen.*—Last, but not least. There you may depend pretty safely on 'Biddy's' ideas. For know, O ye paper men! that if you please the cook, your men will not go out of the house hungry, especially if they *happen* to finish the kitchen to the very last scrap of papering about dinner time."—*Wall Paper T. Journal.*

It has been calculated that if 32,000,000 persons were to clasp hands, they could reach around the globe.

Bedroom Decoration.

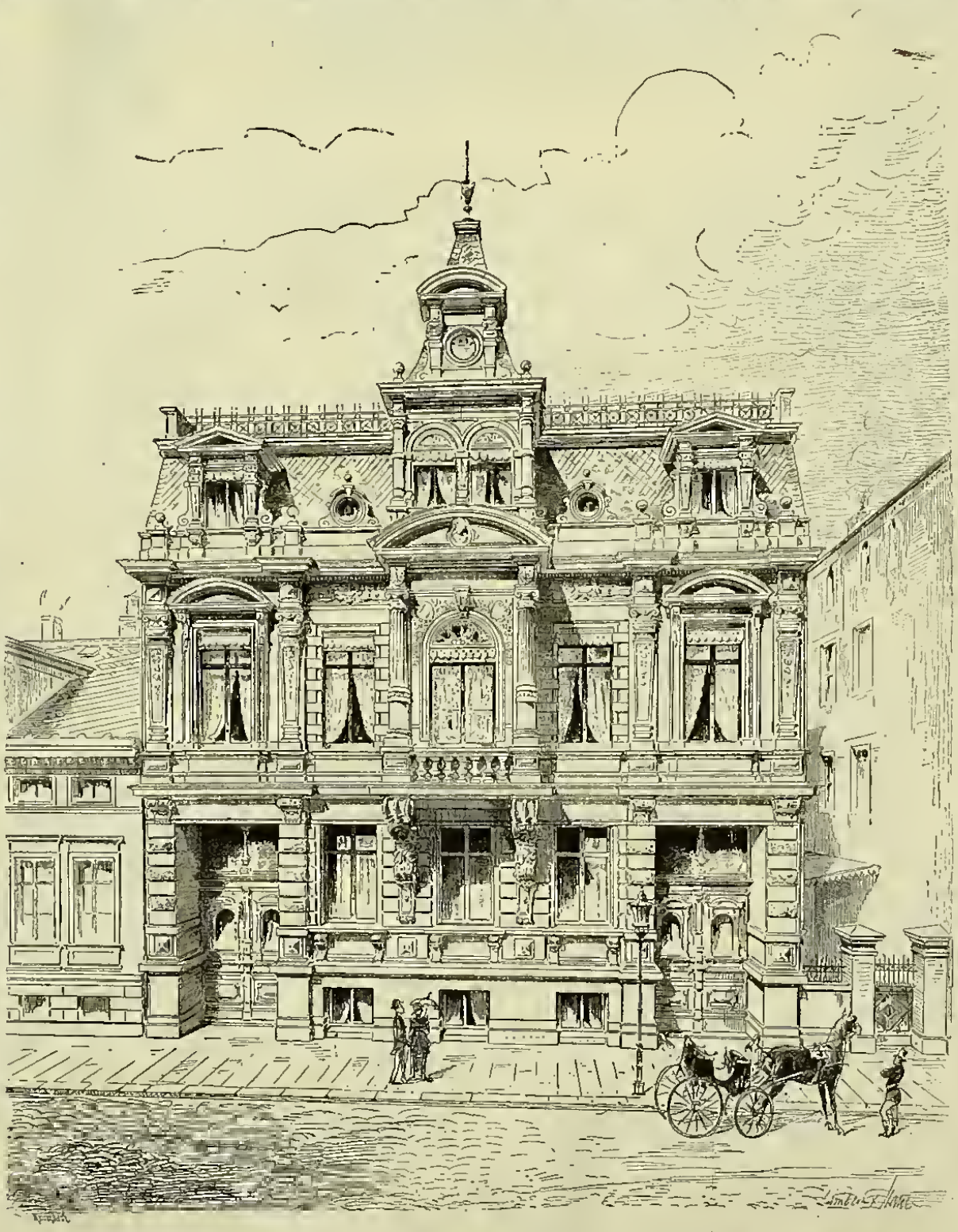
In the best apartments paper hangings are generally selected chaste and handsome, with satin grounds, the figures in subdued colors, yet to harmonize with the hangings; the borders, at top and bottom of the rooms, of paper, unless India paper is used; in that case, gold moulding. I have to notice the prevalence, of late years, in leaving out borders entirely to papered rooms. This arose from two motives, viz., economy and the previous use of extravagant heavy broad borders, which certainly were too preposterous to continue in favor; these causes led to an extreme change, by borders being excluded altogether. This erroneous style is now corrected, persons of acknowledged taste adopting chaste, embossed kinds, such as are in imitation of gimp, shaded lines, moulding, etc., for giving a finishing effect to the tops and bottoms of papered rooms, the paper being fitted close to the sides of doors and windows.

The materials suitable for hangings to bedrooms are so various, it is needless to particularize them, further than that those for the family use may be of highly glazed chintz, of which we have now many beautiful patterns, or of damask, or morone; the colors, crimson, barre, deep yellow, and light morone; these give a warm effect to the apartments. Light green and blue are also frequently used. The fitting up of these apartments may be plain, but full and handsome; if moreen is the material, folded valances are appreciable, in preference to drapery; but damask being soft and pliable, it is well adapted to form any drapery that may be desired. Silk fringe and trimmings, in the same colors, are quite as elegant, and more tasty, if not so showy, as contrasts.—*Paper Hanger's Companion.*

Prof. Vaughan's discovery of a very poisonous ptomaine in cheese, ice cream, and milk undergoing certain chemical changes has been confirmed by a number of investigators in various parts of the country. Vaughan's suggestion that tyrotoxicon may be found to be the poison which produces cholera infantum opens up a new field for investigation, in which every physician must of necessity be interested.

An American's Jubilee Gift.

There is now being built in the Rother Market, Stratford-on-Avon, a structure to combine within itself drinking fountains for men, cattle, and dogs, and a four-dialed illuminated clock, with chimes, the whole being presented by Mr. George W. Childs, of Philadelphia, an American citizen, as a jubilee gift to Stratford-on-Avon. The monument, which is being carried out by Mr. Bridgeman, of Lichfield, according to the design and under the superintendence of Mr. Jethro A Cossins, architect, of Birmingham, will be about fifty feet high to the summit of the vane. It is composed of three stages, and is crowned by a circular spire of concave outline, flanked by four spirelets, each with gilded terminals. The structure is square in plan, with massive diagonal buttresses at the corners. In the base are the troughs and basins of the fountain, all of polished Peterhead granite. Over these, on the four sides, are pointed moulded arches on columns with carved capitals. The tympanum of each arch is filled in with geometric traceries and carved foliage. In each of the four rectangular spaces beneath the springing lines of the arches are inscriptions, all of which were selected and arranged by Dr. Mncauley. In the second story are arcades of three arches, with circular turrets at the corners, and in the upper story the four dials of the clock, under enriched gablets, with finials representing mustard-seed, cobweb, moth, peas-blossom. The buttresses of the lower story terminate in lions and eagles alternately, bearing shields with the arms of Great Britain and with the stars and stripes of the United States. With the exception of the granite basins, steps, and plinth, the whole is to be erected in a fine-grained, very hard, and durable stone, of a delicate gray tint, from Bolton Wood, in Yorkshire. The memorial stone near the base was recently laid by Lady Hodgson.



GERMANY—CITY RESIDENCE OF HERR WINDESHEIM, AT HALLE—F. THIERICHENS, ARCHITECT.

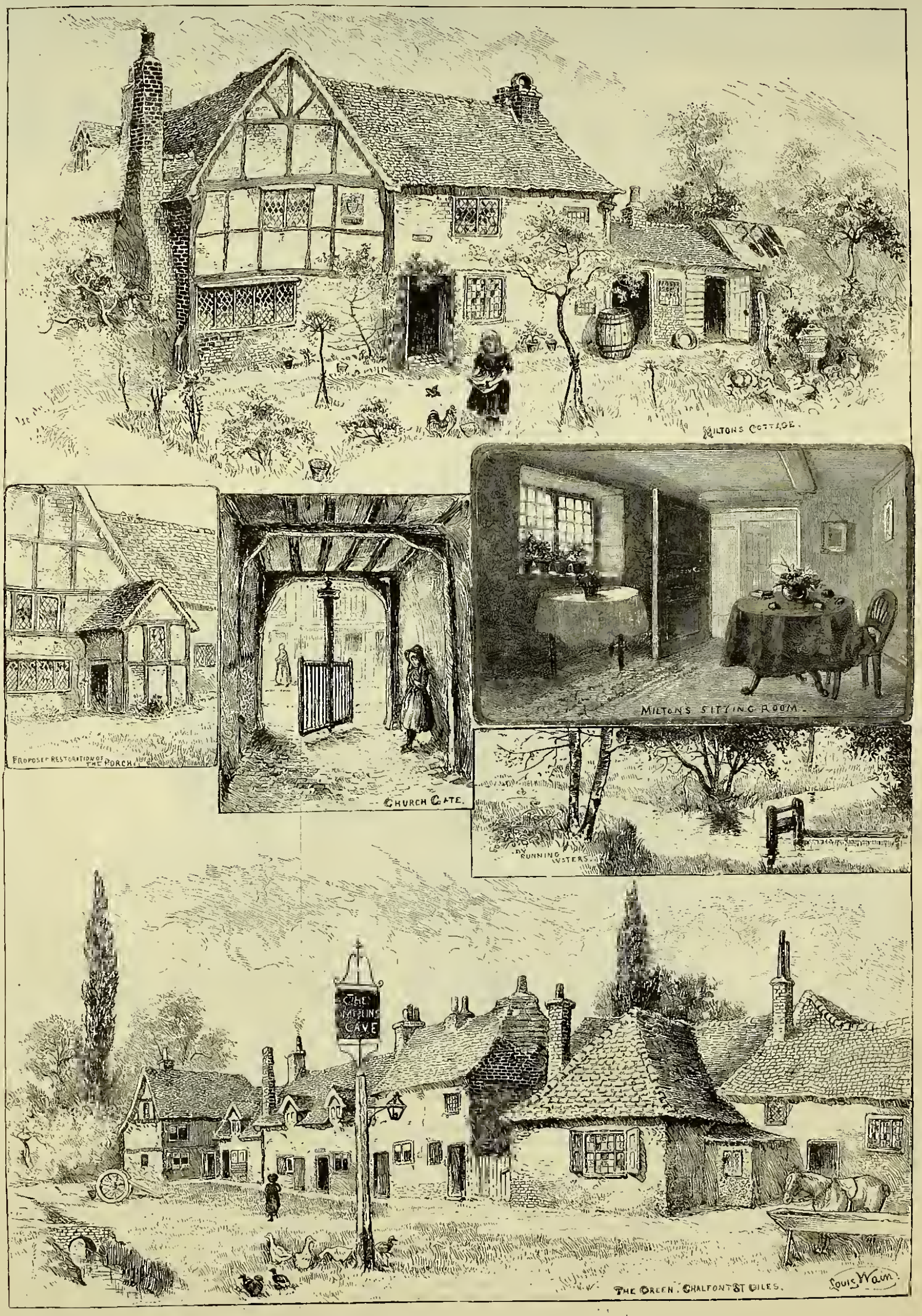
Planting of Trees and Shrubs.

More failures occur, in my opinion, through deep planting than from any other cause, and yet it is far wiser to err on the right side, and plant too shallow than too deep, for in the former case the plant can assist itself, in the latter it is helpless. The roots of plants, as well as the parts above ground, want air and warmth, and if properly accommodated, will soon adapt themselves to the place in which they are to grow. If the surface soil is naturally dry, the roots will run down after moisture, and if it is wet, they will spread near the top, but in no case can a tree or plant, except such as strike root at every joint, flourish if the collar is much below the surface. In planting small trees or shrubs, over which the wind has no power, there is no excuse for deep planting, not even the plea of saving trouble, yet we often meet with even small shrubs planted far too deep.

Of course, all trees over a certain height require to be made firm by staking, or some other method, to secure them from the effects of high winds; otherwise much injury frequently occurs.—*The Garden.*

Disinfection for the Household.

The importance of disinfection of bedding, clothing, and other personal and household articles in contagious diseases demands that health authorities should have under their control establishments where disinfection can be carried out on a large scale and at public expense. Such institutions are now in use in Berlin, Dusseldorf, Gottingen, Strassburg, Breslau, Leipzig, Danzig, and other cities in Europe. The results are pronounced to be exceedingly beneficial. Steam under pressure is regarded as the best disinfectant.



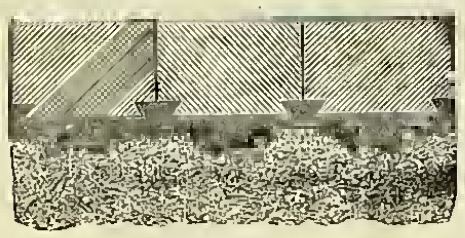
THE HOME OF MILTON.

"HYDROFUGE" FLOORS.

The special features claimed are:

1. Perfect, direct keying of the wood to the concrete (not the bitumen) by means of a hard setting mastic or bituminous composition, which runs into the undercut recesses, both of wood and cement, and dovetails them securely together (see illustration).

2. The difficulty of cutting or making satisfactorily the undercut grooves in the cement is overcome in some cases by introducing specially made corrugated iron channels, and fixing them into the stratum of cement while the latter is still plastic, the very shape of the iron channels holding them firmly in the cement, the straight flange of the iron effectually protecting the edges of the latter against breakage while the



builder's work proceeds. The iron channels are not intended for removal.

3. The "Hydrofuge" is a system by which a "parquet," or wood block, floor can with safety be laid on a concrete foundation, as there is no possibility of detachment, even if the blocks or parquet should shrink.

LADDERING A TALL CHIMNEY.

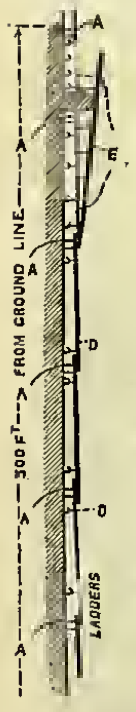
Fifty years ago Messrs. P. Dixon & Sons, of Shaddongate Cotton Mills, Carlisle, built a tall chimney shaft, which is a landmark for miles around, in connection with their factory. This shaft is described in Bancroft's treatise on "Tall Chimney Construction" as being of the following dimensions:

Height from foundation to top, 320 ft. 6 in., and from ground line, 300 ft.; outside measurement at ground line, 17 ft. 4 in., and inside measurement, 9 ft. 0 in.; outside dimension at top, 9 ft., and inside at top, 0 ft. 8 in.; built to a batter of 1 in 72. Being the fiftieth year of this tall shaft, Mr. Robert Todd, woolen manufacturer and present occupier, is having it repaired, and a new copper rope lightning conductor fixed up the outside. Mr. Joseph Ball, known as a chimney and spire restorer and lightning conductor fixer, of York Castle, Oldham, is doing the work.

In carrying out this difficult undertaking, the ascent to the top of the shaft has been made by fifteen wooden ladders of the ordinary type, as used by painters, specially made light and strong for the purpose, and weighing from 20 lb. to 50 lb. each, according to their length, and of the average width of 11½ in. at bottom, and tapered to about 10 in. at top. Distance pieces of wood are fixed at the back of the ladders at top to keep them from the brickwork, thus providing a good foot and hand hold for the workmen.

The procedure of laddering is as follows:

The first length or section of ladder is placed at the base of the chimney shaft, and a hooked wrought iron dog or holdfast, made from ⅞ in. round rod, about 9 in. long, is driven firmly into the brickwork 4 ft. from the bottom of the ladder, and a second iron dog driven into shaft about 4 ft. down from top of the ladder, to which dogs the ladder is firmly lashed. The dogs are formed so as to prevent the lashing of the ladders from slipping when any strain comes upon them—see the annexed engraving. Having lashed the first length, the next step is to place a free ladder against it. This the workman climbs until he can reach about 4 ft. above the fixed length. Here he drives into the brickwork an iron dog, and attaches a pulley block to the same; then one end of the rope reeved round the sheave is brought half way down a second loose section of ladder placed by the side of the first, the rope being fastened; the second length is hauled up by workmen at the base of the shaft until it is half its height above section No. 1; it is then temporarily lashed to the fixed length, and Steeple Jack climbs up and drives another holdfast into the brickwork 4 ft. above its (the second length's) top. He then shifts the pulley block to the upper holdfast and descends. Length No. 2, still attached to the rope at its middle, is then hoisted above the first length fixed, which it overlaps two rounds, and the top of No. 1 and bottom of No. 2 are then securely lashed together, and No. 2 then forms a continuation of the first fixed length. The climber mounts No. 2 length, which is still held by the pulley block and rope, and drives in a holdfast above, shifts the pulley block, and proceeds with No. 3 as he did with section No. 2, and so on until the under side of cap is reached, and here a difficulty presents itself. In Messrs. Dixon's shaft, at about 10 ft. down from the top, a stone cornice



projects 3 ft. The length of ladder coming close underneath this cornice or cap was fixed very firmly. Another length was hauled up until its top was about 5 ft. above the cornice, and then this slanting length was secured to the length below at its foot, at intermediate points, and also close underneath the cornice, by lashings or ropes specially made. In climbing this slanting length the workman's back is toward the ground. A last length of ladder is hauled up and fixed above the cornice, reaching to the top of shaft, and to the bottom of this the top of the slanting ladder is firmly fixed as an additional security, thus completing the laddering of this tall chimney shaft. The whole operation of thus climbing the 300 ft. was accomplished in five hours.

The shaft is now being pointed with mastic about 50 ft. down, and two cracks which are on opposite sides of the chimney, and extend to the bottom, are being repaired.—*The Engineer.*

Stained Glass.

The nineteenth century has witnessed great advancements in the art of making stained glass windows.

The recent improvement in the manufacture of colored glass enables the artist of to-day to reprodnce his designs in glass without the aid of enamels or heavy brush work. The result is an increased brilliancy and gem-like quality of his work.

But in order to put his designs in glass, the artist must have an especial training for it, and give his personal supervision to the work.

When, therefore, artists who have had a long and careful training in their specialty and personally attend to the reproduction of their designs, the conditions are favorable for the very best work. The productions of Messrs. Bray & Breck, of 37 Province St., Boston, point to just such conditions. Their careful training in every department of art stained glass, and their personal attention to every detail of their business, enable them to turn out excellent work.

By their invention on glass mosaics, which they have patented, they can reproduce the most beautiful designs without the aid of brush work.

They also manufacture brass and copper faced glass mosaics for hall lanterns, etc.

Adamant Wall Plaster.

From the remotest time the material now in use as a wall plaster seems to have been the only preparation used for finishing the interior walls of buildings.

That the varying proportions of quicklime, sand, and hair, with the too frequent unsatisfactory result of their combination, should have so many years afflicted a long suffering people is truly a wonder. It was reserved for Prof. Carl Strauh, of Syracuse, N. Y., to perfect, after years of experimenting, a wall plaster in which none of the disappointments of the ordinary mortar occur. This material, which the inventors called Adamant Wall Plaster, is now being manufactured by the Adamant Manufacturing Company, of Syracuse, N. Y.

From the strong testimonials given by all persons who have used it, including architects, builders, contractors, and property owners, we are convinced that this adamant is destined to revolutionize the business of house plastering. The Adamant Company manufacture all grades, from the sand or common finish to the finest grade of marble or hard finish.

Some of the advantages which the adamant possesses above the other plaster is the extreme hardness of the wall. It will neither crack nor crumble, it is a strong support to a building, it does not swell timbers by an absorption of the moisture, as the material itself absorbs most of it, it dries so quickly after it is applied to the wall that in a few hours the frost does not affect it, it can be used without interfering with other mechanical work, it is ready to put on at a moment's notice, avoiding delay in waiting for lime to slake, and it can be mixed in the room where the plasterers are at work.

The extraordinary tests to which the adamant has been subjected to prove its strength and density will strongly commend it for use in churches, school houses, asylums, hospitals, and in all places where there is danger from falling ceilings, or removal by carelessness, or absorption of germs of disease. The adamant is much stronger than ordinary mortar, at the same time it is not nearly as heavy, that is, does not require so great bulk. It adheres to wood, iron, brick, or stone, and becomes as hard as stone in a few hours after it is applied.

Passenger Lift for the Eiffel Tower.

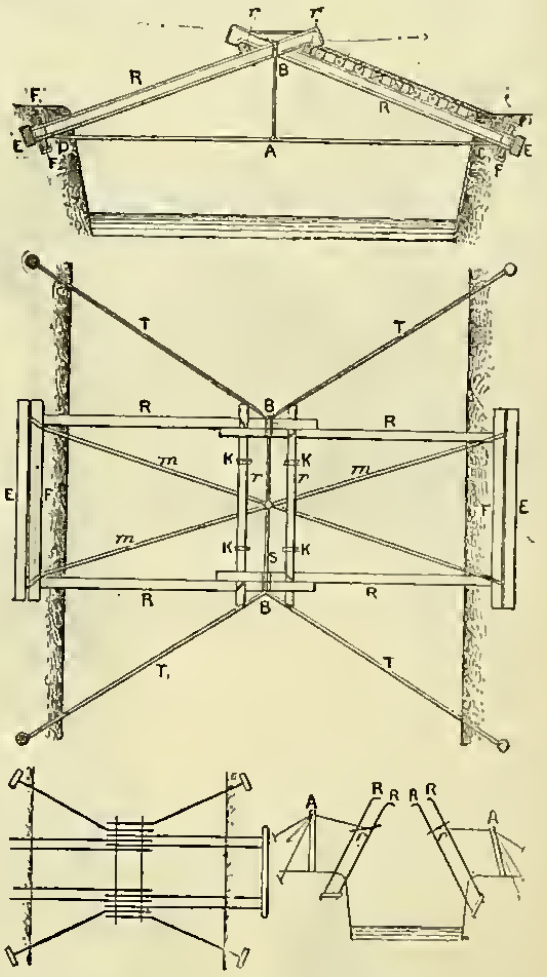
The enormous height of this tower renders a hydraulic lift, in which passengers could perform the whole journey in one operation, quite impossible; and a succession of shorter lifts, requiring frequent changes, would naturally be considered too cumbersome by the public who will use the tower. On the other hand, the employment of a winding engine and a lift similar to those used in mines would not be sufficiently safe, and for these reasons M. Eiffel has devised a new type of lift, in which the whole ascent can be made in one journey, while at the same time it presents absolute safety. The main idea of the lift is that of a huge screw and nut. Below the lift cage is placed a trolley, with three or more wheels running upon an equal number of rails, which ascend spirally, and thus form a screw having so many threads. The trolley will be revolved either by an electric motor or by a water engine; but the cage will be prevented from revolving by guide bars. Thus the passengers will not feel anything of the rotary motion of the trolley underneath, and by selecting the pitch of the screw sufficiently small, any degree of safety against a too rapid descent can be obtained.

TEMPORARY BRIDGES.

While in the field, in European countries, the army always has rails, ties, and telegraph poles at hand. It is by means of these three objects that I have undertaken to construct a simple, strong, and quickly built bridge.

I would remark that iron rails are not indispensable, and that, with pieces of wood of proper dimensions, we may reach the same result.

Say we want to cross a river, and have the above named materials. It may be readily seen from the annexed figures how the bridge is built. As the rails, R R, are connected in pairs, the distance apart, D C, cannot increase much. At all events, abutment cross ties, E E, and two cables, *m m* and *m m*, are there to preserve such distance. The cables may, if desired, be easily and substantially made of iron wire. If the case is urgent, an article good enough for ordinary use may



be manufactured *in situ* with no other tools than a stick and two pickets. The transverse distance from R to R is maintained through ties placed between F and F, and kept close against the rails by other cables that may be readily stretched. So too, above *r* and *r*, there are other ties which are fastened to the latter with wires, K K, and which the cable, S, holds tightly pressed against R and R. T, T, T, T are guys for steadying the structure.

It will be remarked that, taken at other points, these arrangements may be extended or reduced. I give the principle only.

If we admit a pitch of one meter, and a loss of one meter at each extremity of the rails, we shall have: Hall span $x = A\ c = \sqrt{25 - 1} = \sqrt{24} = 4{\cdot}8$ meters. Span = 9·6 meters.

Now, such a length seems too great for anything stable. We may, nevertheless, consider five meters as capable of being passed over conveniently. For great loads, all that has to be done is to double, or even treble, each side, R R, in the following way, and (since, as I have said, I do not use 9·6 meters) to employ the following artifice for giving still further stability: As we are supposed to have wire in quantity at our disposal, it is useless to say that we can render the system thoroughly steadfast. A word as to the simplicity of construction. A and A are two short sheers that serve for bringing opposite each other the two systems, R and R, which at once fit into each other. The cross piece, *r r*, has been fixed, and serves to connect, lay, and support R R. Instead of being of wood, *r r* may be pieces of rail. The pieces, R R, may be bent at the end, as shown in Fig. 3, by means of a forge.—*E. D., in La Nature.*

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THE

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SPECIFICATIONS AND ESTIMATE FOR A TWELVE HUNDRED DOLLAR COTTAGE—COLORED PLATE, SEPTEMBER, 1887.

SPECIFICATIONS AND DRAWINGS.

The specifications and drawings are intended to co-operate, so that any work shown on the drawings and not mentioned in the specifications, or *vice versa*, is to be executed the same as if mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever.

The drawings, taken in connection with this specification, are intended to provide for the completion of the entire carpenter work, mason work, tinning, painting, etc., as well as everything mentioned in this specification.

Quality.—All the material used to be of good quality, free from all defects impairing its strength or durability.

All timber, except where otherwise specified, to be of good, well seasoned hemlock.

Sizes.—Girders to be 4"×8", flush with top of beams; sills to be 2"×8"; plates and interties, 4"×4"; posts to be 4"×4"; first and second floor beams, 2"×8", all 16" on centers; collar beams, 2"×4"; rafters, 2"×5"; hip and valley rafters, 2"×8"; 24" on centers; all studding, 2"×4"; 16" on centers; bearing strip, 1¼"×6"; ridges, 1"×8".

Framing.—All studding placed 16" on centers. All door and window studs to be doubled, bridged once on each floor. Partition studs to rest on partitions below, where possible, and not on the floor beams. Spike a 2"×4" beam to side of girder for floor beams to rest on and spiked well thereto. All headers and trimmers to be doubled, all beams under partitions running parallel with the same to be doubled; the entire frame to be mortised and tenoned and pinned together. Sills to be halved at corners and well spiked together. Studs to run from sill to plate and to be notched out 1¼"×6", and ribbon well spiked in for second tier of beams to rest on.

Flooring.—First and second story floors to be laid with narrow spruce flooring, well driven together and nailed to each and every beam.

Siding.—Cover entire building, except where otherwise shown in the drawings, with sound knotted, narrow novelty boards, nailed every 16", and set nails for putty. Do all necessary furring. Shingle the vertical sides where shown with XXX 18" pine shingles, laid not more than 5" to the weather. All vertical shingles to be laid in straight lines and style shown on plans.

Roof.—The roof is to be lathed with 1"×2" spruce lath; valley and gutters to be lined with the best I C charcoal tin; all joints to be carefully soldered. Do all necessary flashing around chimneys, dormers, porches, etc, also counterflash all chimneys and junctions. Shingle the entire roof with 18" pine shingles, not more than 5½" to the weather. Furnish and put up where required 3" tin leaders, connected with cistern where directed.

Piazza.—The sills and bearing timbers for porches to be 3"×6", floor beams 2"×6", placed 24" from centers, notched into the sill and well nailed; the floors to be 1" thick, 4½" wide, laid in white lead and blind nailed. Steps to have 1¼" treads and ⅞ risers; the roof to be sheathed and tinned; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details. The piazza to be ceiled on the under side, part raked and part on level, with 3" beaded ceiling, ⅞ thick, beams 2"×4". Front steps to be built as shown on plan, with 1¼" strings and steps, ⅞" risers. Use two rough strings between face strings.

Blinds.—All windows, except cellar, to have 1¼" outside blinds, made, hung, and fastened with spring fastenings in the best manner, painted at the factory three coats.

Exterior.—The water table, corner boards, cornice, window frames, bay windows, porches, and all other exterior ornamental work to be made of the best quality of white pine, in accordance with the drawings and details.

Windows and Door Frames.—Window frames to be made for 1½" double hung sash, with 1¼" pulley and hanging stiles; 2" sills and ⅞ sub-sills; 2" axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside and hung at top with 3" narrow butts and proper fastenings. Hanging stiles to all windows will be 4½" wide. Door frames to be made of 1¼"×4½" outside casings.

Sashes.—All sashes, except cellar to be 1¼" thick, dimensions and the number of lights as shown in the drawings; to be glazed with second quality French single thick glass; cellar to be glazed with third quality. The double hung sash to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts, size and number as per plans.

Doors.—The front doors to be 1¾" thick, moulded as per plans, with two panels of plain glass hung with 4½" cast loose butts, fastened with 4½" mortise lock, night latch attachment, brass face, white porcelain furniture and escutcheons. Closet doors 1¼" thick, paneled and moulded one side, hung with 3½" cast butts, fastened with 5" reverse bevel rim lock, white porcelain furniture, etc. The back door to be 1½" thick, secured with mortise lock and two 4" barrel bolts, placed one above and one below the lock. All other doors, not otherwise specified, to be 1⅜" thick, double faced, with mortise locks, furniture to match that heretofore specified. When setting jamb all doors must be hinge and lock blocked.

Stairs.—Build the stairs as shown on the plans, from first to second story, with 1¼" treads, ⅞" risers, and 1¼" strings, to be put up in the best manner, the steps to be wedged with glue and supported on strong carriage timbers. Newels, balusters, and hand rails to be made of ash as per details. Cellar stairs to be rough spruce plank steps housed into strings. Fur off all soffits of stairs complete for lathing.

Trimmings.—The architraves for all doors and windows throughout the house to be made 4" wide, plain face. The bases to be 6" wide with ⅝"×1" moulding on top; all to be of well seasoned merchantable white pine; the base moulding to continue around doors and windows.

Pantries and Closets.—Kitchen pantry to be fitted with shelves on two sides as shown. The bed room closets will be fitted with one shelf and wardrobe hooks underneath.

Cellar Door.—Put up outside cellar door as shown, of narrow beaded ceiling, put together with wrought nails, hung and locked complete.

Cutting.—Do all necessary cutting for plumber. Furnish and put up all necessary boards for plumber to screw his work to.

Hang Shelf.—Put up hang shelf in cellar where directed, of wide ceiling and good strong hangers, 2' 6" wide ×8' long.

Privy.—Build privy 4' 6"×4' 6" square, and 6' 6" high, to be built of sound pine boards. Roof to be covered with boards, door to be hung with 6" T hinges and fastened with thumb latch. Put a button on inside to hold door when desired. Fit up with pine seats, with lids hinged over holes.

Back Stoop and Steps.—The inclosed back stoop shown on plan to be built of sound pine boards well nailed to a frame, composed of 2"×4" wall strips planed, roof covered with tin. Steps to same are to be made of 1¼" pine plank (planed).

The stoop and porch floors to be 1" thick, 4½" wide, laid in white lead and blind nailed. Steps to have 1¼" treads and ⅞ risers. The roof to be ceiled and tinned. Columns, plates, ceiling, etc., to be white pine, worked and trimmed as per details. The piazza to be ceiled on the under side, part raked and part on level, with 3" beaded ceiling ⅞ thick, beams 2"×4".

Blinds.—All windows, except cellar, have 1¼ outside blinds, made, hung, and fastened in the best manner, painted at the factory three coats.

Exterior.—The water table, corner boards, cornice, window frames, porches, and all other exterior ornamental work to be made of good quality of white pine, in accordance with the drawings and details.

PAINTING.

Paint the entire house inside and out, including blinds and chimneys, two coats of good ready mixed paints of such colors as may be selected. All sap and knots to be shellacked before priming is done. Putty up all nail holes, etc., complete. Paint all tin work two coats of

Prince's metallic mineral paint. Also paint privy same as house.

MASON'S SPECIFICATIONS.

Excavations.—Proper excavations, of depth as shown on plans, or the cellar proper, to be abont 4½′ deep. All piers and fonndations 2′ 6″ deep. Stoop foundations 2′ 6″ deep. Earth and rubbish to be removed where directed. All water that may accumulate during the excavation. from any eause whatever, to be removed at onee by the contractor, and the premises kept dry. Also excavate for privy. Size and depth as directed hy owner.

Stonework.—The cellar walls to be of good sized stones, those generally used in the vicinity, 16″ thick, to the full height of cellar, which will be 7′ in the clear, and to be laid, as shown, in cement and lime mortar, with sharp sand. The stone laid binding, the outside where exposed to view to be pointed with cement mortar and cut joints. The inside to be pointed flush and smooth. All angles and corners to be perfectly plumb and the walls level on top.

Brick Piers, etc.—Build brick piers where shown on plans of good hard burnt Jersey hrick, of dimensions indieated on plans. All piers outside to be exeavated for at least 2′ 6″ deep, and filled in with small stone, and well hammered down to a solid bed.

Cellar Steps, etc.—Furnish and set bluestone sills to all cellar windows. Furnish and set bluestone steps where shown, with brick risers and stone eheeks and copings.

Chimney Flues, etc.—Build chimney as shown on plans, of good hard burnt brick. The joints of all flues struck smooth and capped with bluestone caps, 3′ thick, with holes eut in.

Plastering.—The entire house to be lathed and plastered. All to be regular two eoat work and all skin finish, and all done in a good and workmanlike manner, nsing good materials. The mortar to lie at least one week before using. All the ceilings to be hard finished.

MASON'S ESTIMATE.

78 yards excavating. at 25 cts. per yd.....	$19 50
8,600 brick for foundation, at $15 per M, laid.	129 00
Cellar steps, complete	20 00
Chimney, complete	60 00
5 cellar window sills.....	4 00
Brick piers.....	20 00
300 yds. plastering, at 40 cts. per yd.....	120 00

CARPENTER'S ESTIMATE.

1 4″	×8″×24′=	64 feet.	
2 3″	×8″×22′=	88 ″	
2 3″	×8″×24′=	96 ″	
2 4″	×4″×24′=	64 ″	
2 4″	×4″×22′=	59 ″	
28 2″	×8″×22′=	821 ″	
12 2″	×8″×20′=	324 ″	
2 2″	×8″×16′=	42 ″	
6 4″	×4″×16′=	126 ″	
24 2″	×5″×16′=	320 ″	
1 3″	×6″×20′=	30 ″	
2 3″	×6″×14′=	42 ″	
200 2″	×4″×16′=	2,067 ″	
2 1¼″	×6″×24′=	30 ″	= 4,173 ft., at $14 per M. $58 42
1,400 ft. narrow novelty siding, at $32 per M..			44 80
180 ft. 4½″ floor piazza and stoop floor, at $35 per M.....			6 30
320 ft. wide eeiling inelosing back stoop, at $30 per M.....			9 60
175 ft. piazza ceiling, at $35 per M.....			6 12
Back and front steps ready to put up...			8 00
Columns, lattiee, brackets, etc., for piazza, ready to put up.....			22 00
Corniee, complete to put up, for baek stoop and pantry			6 00
50 ft water table, at 3 cts per ft.			1 50
125 ft. main eornice, at 20 cts. per ft.... ...			25 00
Braekets, etc., for corniees and gables..			6 00
Corner boards and bands			4 00
Outside cellar door, complete.....			4 00
1,300 ft. floor, at $25 per M.			32 50
275 1×2 shingle lath, at 4½ cts			12 37
9,000 18″ pine shingles, at $4 50 per M....			40 50
5 cellar windows, complete.....			6 25
1 small window for pantry, complete.....			1 50
14 1st and 2d story windows, eomplete, $6.50 each			91 00
Front doors, complete, with frame and trimmings.....			15 00
Sliding door.....			10 00
11 doors. complete, $4.50 each.....			49 50
250 ft surbase. at 3 cts. per ft.....			7 50
4 small shelves.....			3 00
Stairs. complete			40 00
Shelving closets.			5 00
Nails.....			15 00
Privy, complete.....			10 00
Labor for putting up work.....			200 00
Painting.....			80 00
Total.....			$1,193 00

SPECIFICATIONS, ESTIMATE, AND BILL OF MATERIALS FOR A SOUTHERN RESIDENCE OF MODERATE COST, SHOWN IN COLORED PLATE, SEPTEMBER, 1887.

The estimate on this house without cellar and without plumbing, furnace, etc., is $3,941.68; with cellar, plumbing, and furnace, $5,500.

GENERAL DESCRIPTION.

The huilding will be one story and breast work, with foundation under the whole house. First story 10′; second story 9′ and 8′ 6″ breast work. The first story will be hard finished on two coats brown mortar.

Foundation walls of briek 12″ thick. The frame will be of yellow pine, sheathed with yellow pine boards, and resin sized felting, sided with narrow bevel siding ⅝″ thick; shingled in the gables and sides where shown with cypress shingles, ornamental pattern. Cypress shingle roof.

Interior finish of yellow pine, finished off natural eolor of wood or stained; first floor laid with yellow pine and resin sized building paper.

CARPENTER WORK.

Frame.—The frame to be of sound yellow pine timber, of the following sizes: sills 3″ × 8″; posts 4″ × 8″; plates 4″ × 6″; ties and girts 4″ × 6″; those over hays to be 4″ × 8″; principal partition eaps 4″ × 6″; others 4″ × 4″ and 3″ × 4″.

Beams—Beams first story 2″ × 10″, 16″ on centers; second story 2″ × 10″, 16″ on centers. Headers and trimmers 4″ by depth of beams.

Rafters.—Rafters 2″ × 8″, 2′ on centers; eollars to every pair of rafters 2″ × 6″.

Veranda.—Veranda rafters 2″ × 6″, 2′ on centers; sills and principals 4″ × 7″; beams 2″ × 7″, 2′ on centers; plates 3″ × 8″.

Hips, etc.—Hips, ridges, and valleys 3″ thiek by depth of miters.

Braces.—Long braces 4″ × 4″; door and window studs 3″ × 4″ joist. All studs in principal bearing partition 3″ × 4″, other studs 2″ × 4″, all plaeed 16″ on centers.

Partitions.—All to be properly framed and braced, pinned and spiked, raised in position on foundation, true, level, and plumb.

Bridging.—Bridge all spans of beams of 10′ and over with 2″ × 3″ cross bridging, well spiked in place. Take care to have all studs stand direetly over the ones below wherever practieable. Studs in bearing partitions to run through to girders or partition caps. Lap all beams over full width of bearings. Seeurely anchor all partitions at angles.

Windows.—All windows to be as indicated by the plans. Make and properly set.

Frames.—All other sash to have accessible pocket frames, with 2″ noiseless pulleys; 2″ timber sdls; 1¼″ false sills; pulley and hanging stiles. Frames to have a quarter round placed in the sash grooves top and bottom, to stop the sash about 3″ from hottom and top.

Sash.—All sash to be of clear, seasoned yellow pine, lipped and moulded 1½″ thick, divided for glass as shown and to he double hung to iron balanee weights, with best braided hemp sash cord. All to be fastened with bronze bell tip Ives sash locks.

Glass.—The glass for all windows will be filled with polished plate double thiek French sheet glass for large lights and single thiek for small ones. The front door will have rolled cathedral glass. Provide and hang complete. Inside Venetian cypress blinds of best make to all windows.

EXTERIOR FINISH.

Inclosing.—The exterior sides of frame, except the roofs, will be covered witb thicknessed yellow pine box boards not more than 10″ wide, laid elose and securely nailed to all bearings. Cover all the above sheathing boards with a good quality of tough resin sized sheathing paper, lapping each course at least 2″; placed under all outside easings and corner boards.

Siding.—Cover exterior walls where indicated from water table upward to shingle line with elear bevel siding free from knots, shakes and sap, to lie not more than 4″ to the weather. Said siding to be resawn from 1¼″ plank; secured on in most thorough manner with galvanized iron clapboard nails, with all joints carefully made and eut against all corner boards and hanging stiles.

Shingles.—In the gables and sides lay cypress shingles of ornamental patterns, all as indicated.

Water Tables, etc.—Form all water tables, outside casings, belt eourses, and cornices as indicated, for which working drawings are furnished to exactly aeeord with scale drawings. Corner and angle boards will be 1¼″ thick; water table ⅞″ with 2″ cap moulding. Neat window caps as shown.

Roofs—All roofs to be covered with best cypress shingles, laid three thick on 1¼″ × 2″ yellow pine shingle lath. Shingle lath to be strongly spiked to each rafter and the shingles carefully and well nailed on; joints hroken to ⅓ width of shingles.

Gutters.—Form gutters in main roof corniees in best manner with 1 X charcoal tin, previously painted both sides hefore laying with Prince's metallic paint. The form for said gutter to be carefully laid to insure a good run for water to the several outlets, and to drain dry; outlets fitted with strong metallic strainers.

Flashing.—Do all necessary flashing around chimneys and wherever required to make a complete job, and line all valleys in best manner with 1 X charcoal tin, previously painted both sides before laying with Prince's metallic paint.

Leaders.—Put up where indicated from gutters galvanized iron leaders 3″ and 4″ in diameter, as required, with expansion tops.

Veranda.—Build the verandas and haleonies as shown.

Floors.—Floors to be laid with clear 1⅛″ × 4½″ tongued and grooved yellow pine flooring, joints leaded and blind nailed. The outer edges of flooring to be rounded and to have cove and faseia.

Columns.—Turned columns to be 8″×8″, made of yellow pine (clear). Moulded rails 4″×5″ for upper and 3½″×4″ for lower. Balusters 3″×3″, square and turned. Cornices moulded, whieh is drawn to ¾″ scale as shown on details. Ceil overhead with yellow pine eeiling ⅞″×2½″, blind nailed. Mould around the angles with a neat moulding 2″×2″. Support the verandas on 12″×12″ brick piers.

Lay the roofs of best cypress shingles as required for main roofs; put on in best manner. Form deep gutters in veranda, inclining to the outlet, each to empty through 3″ galvanized iron expansion top leader on the ground. Gutter outlets to have strong metallie strainers, as provided for main roofs.

INTERIOR WORK.

Before laying any floors, earefully test and bring to a perfect level all beams, especially under sliding doors.

Floors.—Lay the entire first and second floors with thieknessed yellow pine plank not more than 5″ wide, laid horizontal and firmly nailed to all bearings.

Trimming.—The casings for all doors, windows, and other openings in first story will be made of perfeetly elear and seasoned yellow pine, moulded to design ⅞″ × 6½″, cut against corner and base blocks at angles as required. The corner blocks will be turned to a neat design, and the base blocks will remain plain. The easings will extend to the floor for windows as well as doors, with panel baeks under each window. Base for all the principal rooms and hall ⅞″×8″, including the shoe and top moulding, to mateh the casing. The base moulding will eontinue up and over the casings. Closet base 5″ wide, easings 3½″. Put down yellow pine saddles to all the doors of suitable widths; rubber stops to be placed behind all doors requiring them. The trimmings in pantry and hack hall to be plain 5″ wide, 6″ base, with wall moulding.

Bath Room.—Fit up the bath room in a neat and workmanlike manner, of dry and elear materials as required. Ceil the sides with ½″×2½″ yellow pine to a height of 4′ 0″ and cap with neat mouldings, the floors being laid with yellow pine as before required.

Drain Board.—Fit on drain board for sink.

Doors.—All doors to be of the size and design required by the plans, made of clear seasoned yellow pine well framed, paneled and moulded All the single doors will have five panels in eaeh, while the large folding doors and the double doors will be made to mateh with raised panels and neat flusb moulding. The front doors as shown with the fan light glazed with plain glass. Doors to have raised panels and neat flush moulding. The jambs will be 1″ thick throughout, with neatly moulded stop of a width to form rabbet. Provide and put up rough jambs to all openings for mason to plaster to, only setting the jambs when all the walls are dry.

Pantry.—Fit up pantry in thorough manner, of seleet shelving hand smoothed. The counter shelf will be 20″ wide; all others 12″. Plaee the shelving at suitable distanees, one above the other, to tbe height of door easing, where run a eontinuous shelf all around the upper part.

Closets.—Fit up all other closets in the usual manner, putting clothes hook strips neatly moulded, and hook with Goodwin elothes hooks in the minor rooms and ornamental bronzed iron hooks of approved pattern for the principal rooms.

Hardware.—The principal part of first story to have 4½″ brass face mortise locks, closet doors reverse bevel rim, jet and bronze knobs, laequered butts, front doors 6″ mortise lock night lateh attachments. Second story to have nickel plated and white porcelain furniture and plain cast butts. All windows to bave bronze sash locks All hanging closets to be furnished with double wardrohe hooks. Furnish and set all necessary closet catches, buttons, etc., complete.

Vents.—Cover all vent holes in foundation walls with ¼″ mesh galvanized iron wire, well taeked to frames set in the brick walls.

Mantels and Grates.—The owner will furnish all mantels and grates. Take from eatalogues of the manufacturers, but the contraetor will furnish all necessary materials for setting same.

MASON WORK.

The eontractor will stake out position of building as

directed, with all necessary stakes indicating the outlines of building, taking care to secure correct lengths, widths, and true angles.

Excavation.—Do all necessary excavating for trenches to walls, piers, chimneys, and for all other work requiring it, at least 2' 6" deep. Deposit the soil in a separate heap. Grade the surplus earth around the building and grounds under the direction of the owner.

Trench Walls.—Make the trenches 6" wider on each side than the walls.

Brick Walls.—Build all the walls from bottom of trench to 3' 6" above the natural grade, of good hard burnt brick, laid in course headers every seventh course. These walls started on solid concrete footing; this also applied for all piers and chimney foundations. Chimneys and piers built of same quality of brick as foundations, the best selected for chimneys where exposed to view. The whole outside of these brick walls to be cemented from bottom to top with strong Rosendale cement to prevent the water from coming through.

Chimneys.—Build upon solid concrete footings the chimney stacks, as shown, with flues as indicated, to be built up perfectly solid and true, with joints thoroughly filled. Joints struck and pointed up outside and in. Plaster tightly around all openings. Make all necessary provision for grates. Chimneys at least 1' in clear of all framework. Cap with 3" bluestone caps with holes cut in.

Mortar.—All brickwork to be laid up in mortar composed of lime 1 part, and clear, sharp sand mixed in proportion, with ⅓ cement added to the time of using.

Bluestone.—Place flagging the length of steps before the steps leading from all veranda entrances 3" thick 4' wide.

Fireplaces.—Lay the hearths with ornamental tiles bedded in cement, joints filled in.

Arches.—Turn arches to all fireplaces on iron chimney bars, and trimmer arches under the hearths.

Plastering, Filling-in.—Fill in above all sills, ties, and girts; partition caps 8" high, with brick and mortar to prevent mice from passing up walls or partitions.

Lath.—Lath with best spuce lath all walls, partitions, and stairways, ceiling, and closets, of the first and second stories. Laths set thickness of a lath apart. Not more than eight laths to a break on ceilings and twelve on sides, securely nailed to all bearings

Plaster.—All the above lathing to be plastered with a scratch coat, brown coat, and hard finish. Plastering to go down to floor in all cases, and to be worked close to all grounds.

Cornices.—Run neat cornices in parlors, hall, dining room and other principal rooms, first story and second story hall.

Mortar.—Plaster to be composed of first finishing lime and clean, sharp sand, with a plentiful mixture of fresh long goats' hair. All the work to be true and plumb and rendered hard by troweling, care being taken to avoid spots and blisters and other defects.

Center Pieces.—Center pieces in all the principal rooms, first story and second story hall. Average cost, $2.50 each, exclusive of setting. Selected by owner. Plasterer to patch up and repair after artisans and leave all perfect. This contract does not include cellar.

Painting.—All the exterior woodwork usually painted to be painted two good coats of best Atlantic white lead and linseed oil paint. All knots and sap to be well shellacked before priming. All cracks, joints, and nail holes, and over nail heads to be well puttied after priming is done. All tin work to have two coats of Prince's metallic paint Also paint the chimneys two coats. All the colors to be selected by the owner. The interior will be wood filled with Wheeler wood filler, then two good coats of hard oil finish. The first and second stories, and main stairs and balusters and rails will be rubbed down to a smooth surface. All the doors, saddles, hearth borders, will be oiled. All sash and outside doors must be painted on top and bottom. The painting must follow immediately after the carpenters.

ESTIMATE FOR MATERIALS.

2	pieces	3"×8"×23'=	92 feet.
4	"	3"×8"×32'=	256 "
1	"	3"×8"×25'=	50 "
1	"	3"×8"×16'=	32 "
1	"	3"×8"×20'=	40 "
1	"	3"×8"×18'=	36 "
1	"	3"×8"×24'=	48 "
3	"	3"×8"×22'=	132 "
1	"	3"×8"×26'=	52 "
4	"	3"×8"×12'=	96 "
41	"	2"×10"×17'=	1,148 "
0	"	2"×10"×23'=	234 "
50	"	2"×10"×16'=	1,333 "
44	"	2"×10"×13'=	953 "
20	"	2"×10"×20'=	080 "
16	"	2"×10"×25'=	661 "
13	"	2"×10"×12'=	260 "
34	"	2"×10"×32'=	1,836 "
7	"	2"×10"×18'=	210 "
3	pieces	2"×10"×12'=	60 feet.
1	"	4"×10"×22'=	73 "
2	"	4"×10"×16'=	126 "
4	"	4"×10"×12'=	160 "
2	"	4"×6"×22'=	88 "
8	"	4"×6"×21'=	336 "
2	"	4"×6"×28'=	112 "
2	"	4"×6"×20'=	80 "
2	"	4"×6"×14'=	56 "
20	"	4"×6"×16'=	640 "
1	"	4"×6"×17'=	34 "
1	"	4"×6"×13'=	26 "
1	"	4"×6"×30'=	60 "
2	"	4"×6"×18'=	72 "
1	"	4"×6"×25'=	50 "
1	"	3"×8"×30'=	60 "
1	"	3"×8"×14'=	28 "
1	"	3"×8"×18'=	36 "
1	"	3"×8"×28'=	56 "
14	"	2"×8"×21'=	392 "
47	"	2"×8"×16'=	1,002 "
27	"	2"×8"×26'=	936 "
24	"	2"×8"×20'=	648 "
1	"	2"×8"×30'=	40 "
1	"	2"×8"×24'=	32 "
2	"	2"×8"×25'=	65 "
5	"	2"×8"×14'=	93 "
5	"	2"×8"×13'=	87 "
2	"	4"×8"×22'=	117 "
800	"	3"×4"×12'=	9,600 "
			23,314 "

23,314 feet timber, yellow pine, at $20 per M...	$466 28
1,600 " weather boards, at $30 per M.....	48 00
5,000 6×18 cypress shingles, at $10 per M.....	50 00
340 feet verges and cornice, milled out, at 28 cts. per ft	95 20
400 " small cornices, at 20 cts. per ft.....	80 00
15,000 0×24 cypress shingles, at $12 per M.....	180 00
1,000 1×2 shingle lath and furring, at 4 cents each.....	40 00
6 8×8 turned columns, at $2.25 each.....	13 50
5 8×8 short turned heads, at $1.50 each....	7 50
1 square column	1 50
80 feet piazza rail, worked, at 20 cts. per ft..	10 00
20 " of rail for back piazza, at 15 cts. per ft	3 00
22 " balcony rail, at 20 cts. per ft.....	4 40
112 3×3 turned balusters, at 20 cts each.....	22 40
6 filling circles for piazza and balcony.....	15 00
All gable filling.....	12 00
220 feet water table, fascia, etc., at 7 cents per ft.	15 40
1,000 " piazza ceiling, at 3 cts per ft.....	30 00
1,000 " piazza floor, at 4 cts. per ft.....	40 00
Front stoop, ready to put up.....	8 00
Back stoop, ready to put up.....	5 00
600 lineal feet 1¼×6 strips, at 4 cts. per ft....	24 00
450 square feet tin, at 7 cts. per sq. ft.....	31 50
125 feet tin leader, at 12 cts. per ft.....	15 00
4 brackets for back piazza, at 50 cts. each..	2 00
4,500 feet floor inside, at 3 cts. per ft.....	135 00
27 first story window frames, blinds and sash and trimmings complete, at $8.50 each..	229 50
20 second story window frames, blinds and sash and trimmings complete, at $8 each	160 00
4 frames and sash for loft, at $12 each.....	48 00
16 first story doors and trimmings complete, at $7 each.....	112 00
9 second story doors and trimmings complete, at $6.50 each	58 50
2 stairs put up complete.	150 00
450 feet surbase, at 4 cts. per ft.....	18 00
Prepared material for fitting bath room..	12 00
Prepared material for 6 closets and pantry.....	18 00
Labor in putting up work.....	800 00
Nails and incidentals.....	75 00
	$3,041 68
Painting work.....	200 00
Mason work.....	700 00
	$3,941 68

Use of Gas Tar.

I have noticed in "Notes and Queries," occasionally, inquiries as to how to thin gas tar so as to use it as paint, and I have been surprised that spirits of turpentine and gasoline should be recommended. I have never been able to mix turpentine and gas tar (from Philadelphia gas works), and gasoline I consider dangerous, and so volatile that it needs to be added frequently or the tar gets too thick.

For over twenty-five years I have used gas tar for painting tin roofs, and the best thing for thinning tar is oil, and where it can be had I prefer resin oil, which can be procured in any city. It is cheap and as durable as the tar, which animal and linseed oil are not, but the kind of oil makes no difference excepting for the cost. Tin is not injured by it.

CHAS. R. WEBB.

Philadelphia, Aug., 1887.

Gardens at Railway Stations.

There are few more encouraging signs of progress in horticulture than the spirited way in which the growth of beautiful flowers for embellishing railway stations is being taken up by many of the employes of the railway companies. Country stations are generally dull and dreary; therefore an object like the one under notice should receive the highest encouragement, and that for many reasons. I was never so impressed as when, a short time ago, having to wait some time for a train, I walked up and down the platform, admiring and inhaling the sweet perfume of roses, pansies, and pinks.

In the midst of these flowers there came to mind recollections of stone gardening so common at some stations—broken red bricks, whitewashed flints, and other incongruities, arranged where, if nothing better could be provided, green turf would be preferable.

At the present time a pretty line, from beginning to end, is the branch running from East Grinstead to Brighton. The high level of East Grinstead Station does not permit of much being done, but one can catch a glimpse of the station master's garden, which adjoins. It is neat and simple, the useful as well as the ornamental being visible in the shape of good crops of vegetables and plenty of roses and pansies. The railway slopes round the station buildings are furnished with shrubs and flowers, a most pleasing contrast to the dreary waste of refuse generally seen.

On the low level large rose bushes are to be seen on the walls. 'Gloire de Dijon had over 100 flowers expanded at one time. Reluctantly we leave this and go on to the next station, Kingscote. The traveler little expects the vision of beauty awaiting his arrival. This station can claim to be one of the best anywhere to be found. The company gives prizes for the prettiest stations on their lines, and last year Kingscote took first; but, not content to rest upon his well-earned laurels, Mr. Ward, the station master, has again produced a display difficult to equal, much more to beat. He possesses a little glass house, erected at his own cost, and tended during his spare time. In this house are wintered many of the plants that now help to make such a gorgeous display.

Beneath the covered portion of the platform, on both sides of the door, are two large groups, 1,200 pot plants being used in the arrangement. Pelargoniums were in profusion, noticeable being Henri Jacoby, the color even more effective in the subdued light. Ivy leaved pelargoniums suspended from the roof were very nice; also the fuchsias, among which were good, well-flowered specimens of the fine old F. fulgens. Old tree roots made excellent receptacles for hardy ferns and stonecrop.

The little borders along the back of the open part of the platforms were perfect pictures, produced, not by elaborate bedding out, but by the culture of good old fashioned flowers. Pansies had been one mass of flower, and the plants, though apparently somewhat exhausted, will soon be reinvigorated by the rich top dressing that has been given them. Pinks, especially Mrs. Sinkins, were strong, healthy, and full of flower. Pinks are worth growing if only for the nice color of their foliage, which is much prettier than some of the sickly variegations sometimes met with. Behind the borders is a little wooden fence, which will soon be draped with roses. There are many fine blooms, and two bushes of the old moss rose had individual flowers larger than we have ever seen in gardens.

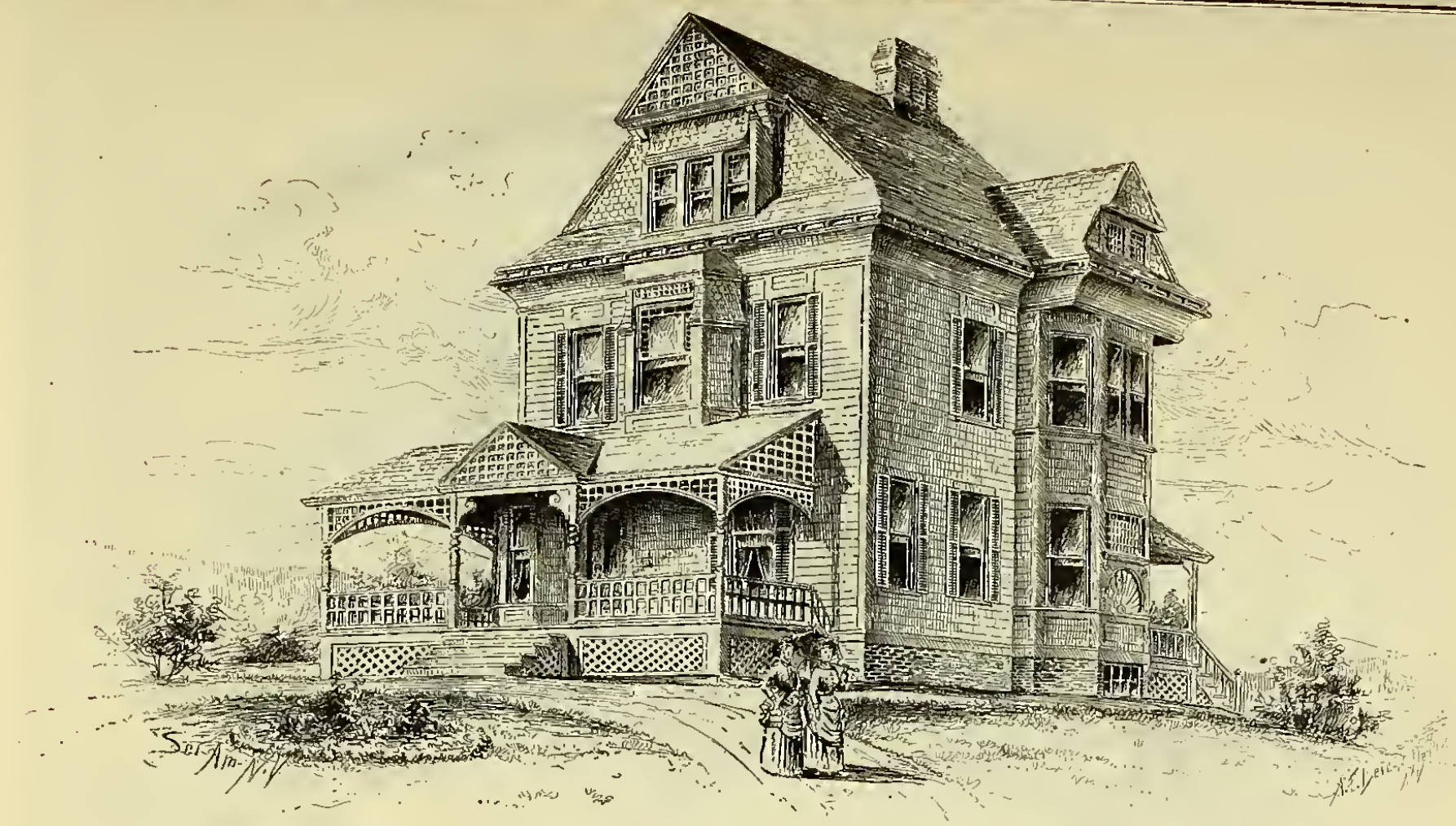
Those who use this station must feel they owe a debt of gratitude to a man who voluntarily provides them with such a treat, and that at no small expense to himself. At the next station, West Hoathley, all was blank. True, there was a small glass house at the back, but the occupants appeared dead. We hope the station master may become imbued with some of the enthusiasm so conspicuous among his fellow workers.

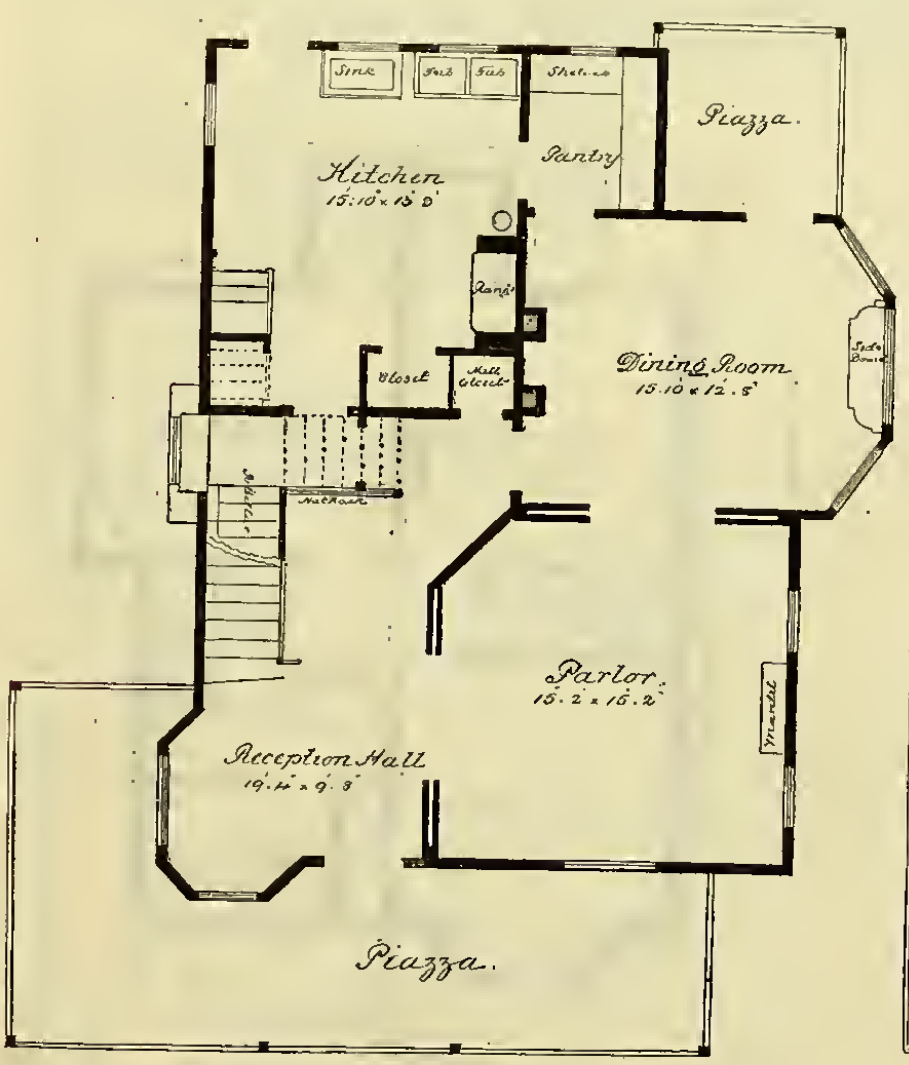
At Horstead Keynes we were again in the land of plenty. Roses, pinks, and pansies were at their best. Here and all along the remainder of the line a mistake has been made by planting laurel and privet to form a hedge in front of the fence, which will ultimately preclude the possibility of growing flowers. A little forethought, and this might have been avoided.

Sheffield Park was brightened by roses, pinks, antirrhinums, and sweet Williams. At Newick and Chailey, roses were very good, while beneath the covered way a small rockery had been constructed from the natural sandstone of the district and planted with hardy ferns and London pride, which looked nice and fresh.

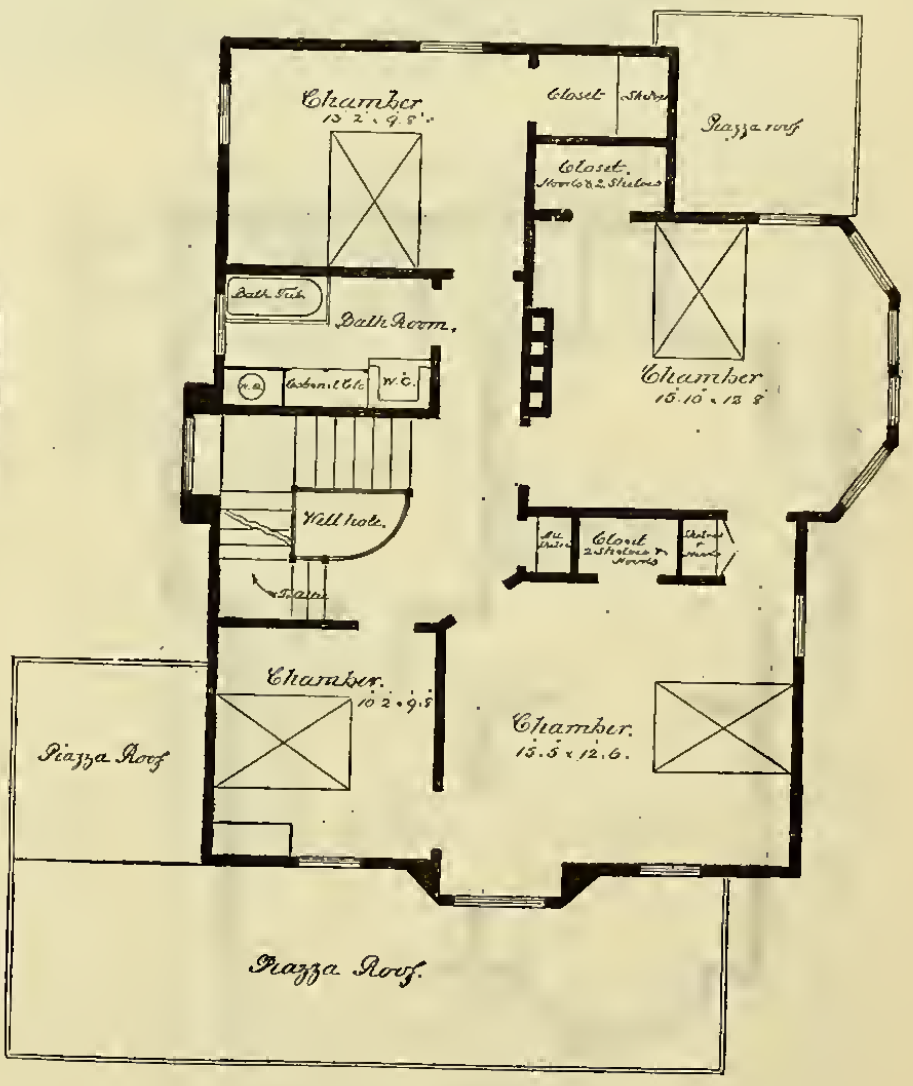
As one gets nearer Brigbton, Flora seems to have been less profuse in her gifts, but about Lewes Station there are plenty of trees, and between there and Falmer were banks literally draped with ivy and having a beautiful effect. Other banks were clothed with St. John's wort.

London Road, which is really a part of Brighton, had a large bed of Canterbury bells in full summer beauty, but, utterly regardless, the train steamed away into the seaside metropolis, and ended the pleasantest and prettiest journey ever made by rail.—*A. Herrington, the Garden.*





PLAN OF FIRST STORY.



PLAN OF SECOND STORY.

A $5,000 DWELLING.

A $5,000 DWELLING.

This house has a front 28 ft. over all; side 38 ft. over all. The floor plans show the size of rooms.

Height of stories (measured in the clear): Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

Materials.—Foundation, 18 inch stone wall; first and second stories clapboarded with 5 in. claphoards; roof black slate.

Cost.—This house has been built near this city, complete with all the modern improvements, furnace excepted, for $5,000. If the attic is not furnished, simply floored, it would make a saving of about $150.

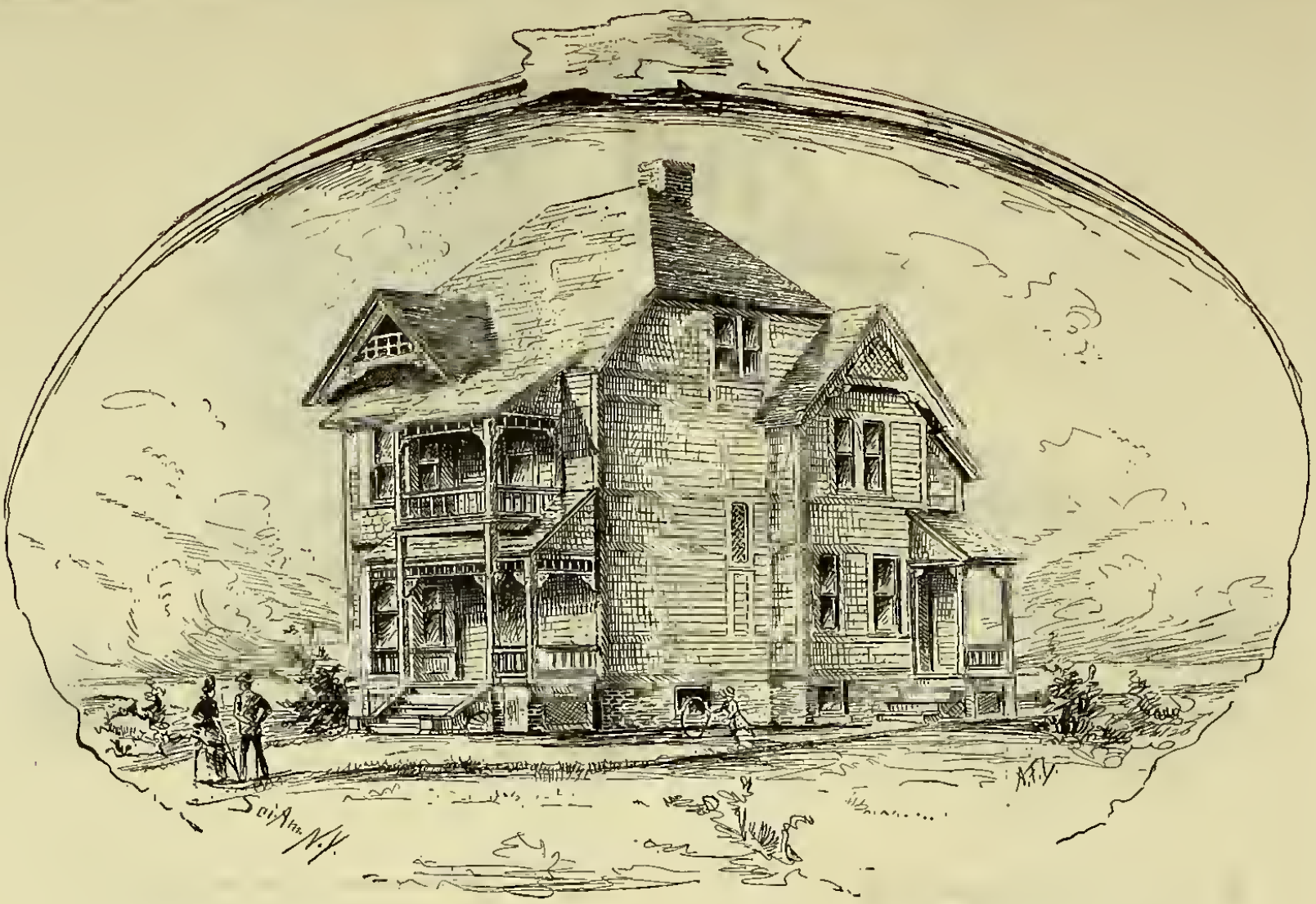
There is a cellar under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall. A back stairway leads from kitchen to platform of main stairs. The position of the stairway affords convenient access from kitchen to second story.

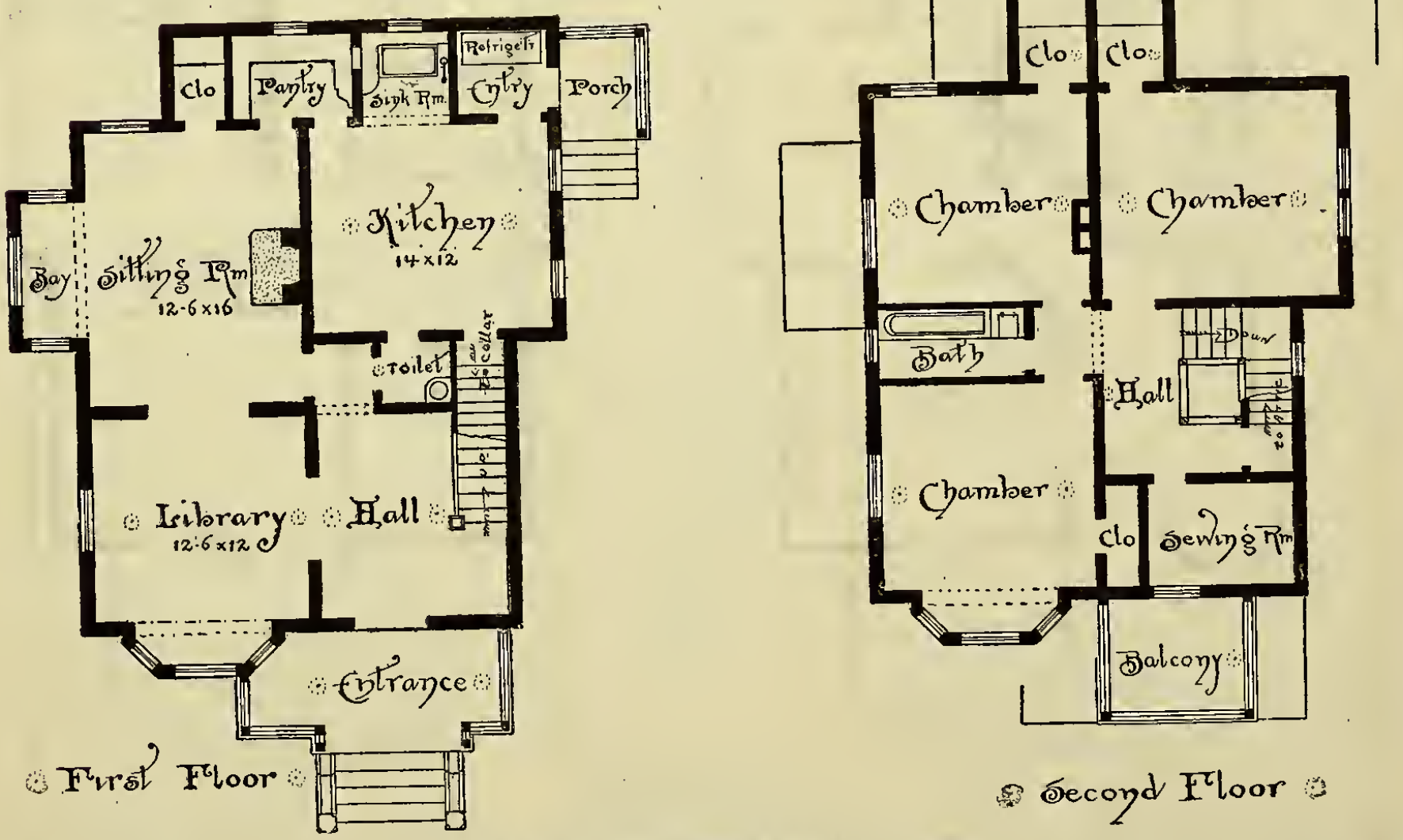
Further information can be had by addressing Munn & Co., architects, at this office.

Removal of a Dividing Wall.

A new method for supporting walls has been inaugurated by Architect Frederick Baumann, of Chicago. It became necessary to take out the first story of a dividing wall in a double store building, supporting the wall with iron beams, the ends resting on iron columns. Instead of using screw and needles, as is usual in such cases, the architect conceived the idea of removing the wall from the line of the ceiling to a little below the floor line, for a distance of 126 ft., in nine equal spans, and inserting the columns without any temporary support.

This was done by first cutting through the wall where the column was to be set; then a firm foundation was secured through placing a curved cast iron bearing plate in the wall below. Upon this were placed two footing plates, with steel wedges between. The column was then placed on the footing plates, and a stone cap placed upon the column, and the space between this and the wall above filled with brick set in Portland cement. After allowing this to stand for a day, the steel wedges were driven up until the column formed a substantial support. After all the columns were set in this way, the iron I beams upon which the wall was to rest were introduced. This was done by cutting half through the wall on one side, placing the beams, and then placing those on the opposite side in the same manner. The work was perfectly successful, and no settlement of any kind occurred, though each column supports a weight of over 110 tons. It was observed, however, that the utmost care and the constant watchfulness of the architect were necessary, as the entire operation was a delicate one from an engineering standpoint, the slightest neglect or mistake, especially in keying, being liable to lead to serious results. Mr. Baumann's method will doubtless be followed generally where the same work is to be accomplished, namely, the substitution of the columns for the lower part of a dividing or outside wall. From this demonstration it would seem that the plan may be adopted for buildings of almost any height, at a great saving in time and cost.—*Inland Architect.*





A THIRTY-FIVE HUNDRED DOLLAR COTTAGE.

A $3,500 COTTAGE.

The accompanying sketch represents a small but conveniently arranged frame cottage of seven rooms, designed by Geo. H. Blanden, architect, Springfield, Mass.

There are three rooms on the first floor, three on the second, one bed room in the attic, also a room in the attic for storage.

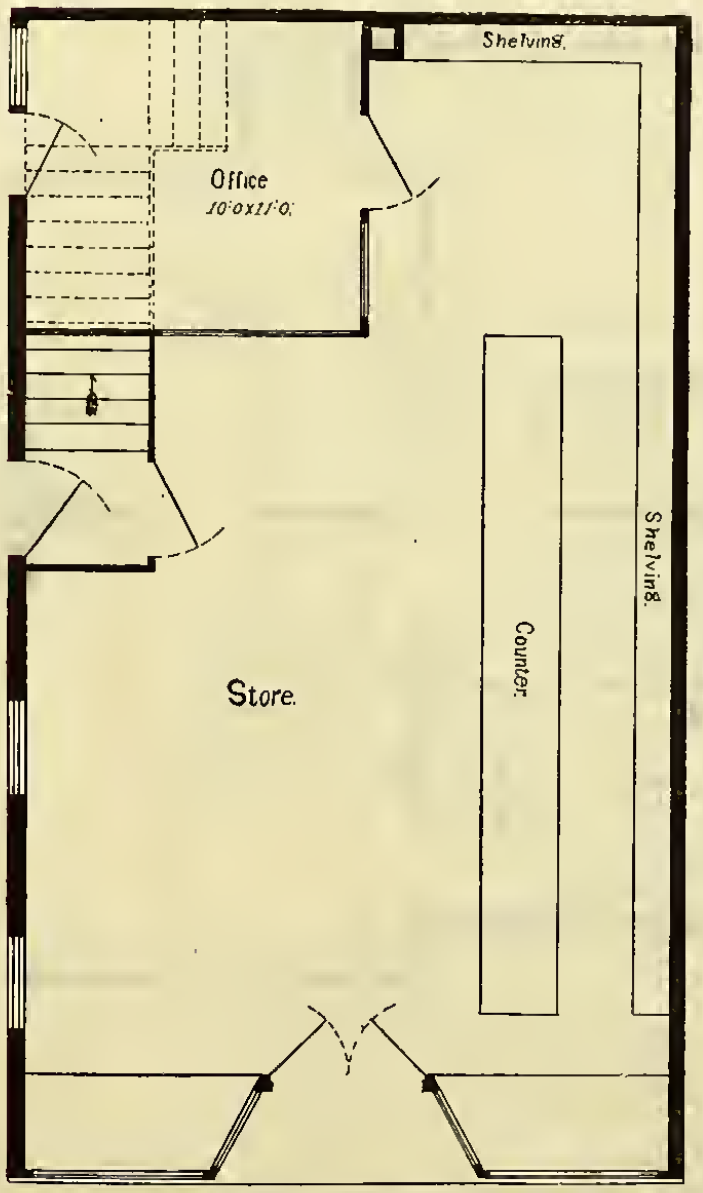
The foundation is of brick, nine inches thick; with an air space. The exterior walls are of frame, 2×4 inch studding, covered with hemlock boards, paper, and with exterior finish of extra spruce clapboards and bands of cut shingles.

The interior finish is mill-worked white pine, painted, except the stair case, which will be ash finished in oil.

The cottage will cost $3,500.

Plate Glass.

The history of the business of insuring plate glass against breakage furnishes some curious statistics, as well as a good deal of information of value to architects and builders. It seems, from the Boston *Transcript*, that notwithstanding the insignificant appearance of its business streets in comparison with those of New York or Chicago, Boston possesses more plate glass, in proportion to its population, than any other city in the country, and the insurance companies find much employment there. At present, most of the insurance on glass is done by two companies, the Lloyd's Plate Glass Insurance Company and the Metropolitan Plate Glass Insurance Company, both of New York. The premium is a small percentage on the value of the glass —about two or two and one-half, we believe—and three-quarters of all the plates in Boston are said to be covered. It is estimated that there is one break a year in every eight windows insured, so that the premium does not seem unreasonably high. Losses are settled by the replacing of the glass, instead of a payment of money, and disputes are thus avoided, while the owner of the building and his tenants are spared the trouble of attending to the matter for themselves. In Boston, about one plate a day represents the loss to the companies, and the breakages occur from an almost infinite variety of causes. The usual cause is, naturally, stone throwing of boys or men in the streets; and out of one thousand breakages, about three hundred are due to this. According to the statistics of the Lloyd's company for 1885, the most active glass breakers, next to stone throwing boys, are burglars, who broke in that year about ten per cent. of all the sheets in Boston which the company had to pay for. Pistol shots produce



FIRST FLOOR PLAN.

SECOND FLOOR PLAN.

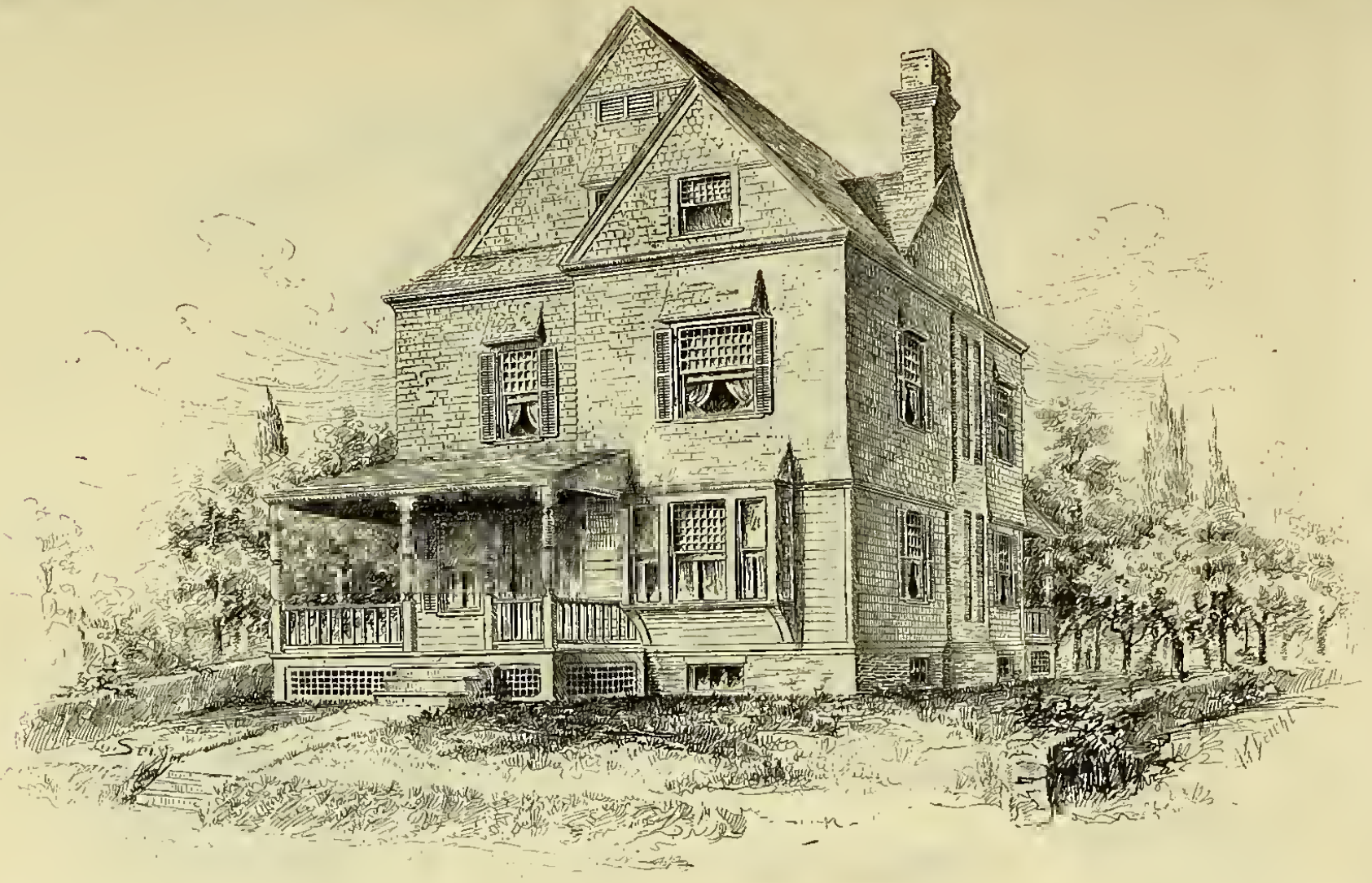
A COUNTRY STORE COSTING $2,000.

many breakages, and, even in quiet Boston, about one plate is broken by a bullet for every four broken by stones. Next to missiles of various sorts, the wind is the greatest enemy of plate glass, many lights being blown in by tempests, while many more are broken by the slamming of doors and blinds. Much less pains is taken to protect large lights in Boston than in New York, rolling shutters, so common in New York, being rare in Boston, but the premium rates are the same in both places, and perhaps the miscellaneous causes of destruction, which are accountable for thirteen per cent. of the breakages, are more active in New York. One of the heaviest losses of the kind that we remember occurred in the latter city some years ago, where a large number of plates of different sizes, intended, we believe, for the front windows of the first story of a hotel, had been taken out of their boxes, and were placed against the wall of one of the rooms, ready for setting. The glaziers were at work, and one of them, looking for the particular light which he wanted next, found it in the interior of the stack, close to the wall. He tried to pull it out sideways, and in doing so tipped the rest of the plates forward. The whole mass fell to the floor with a crash, breaking every plate, and causing a loss of about five thousand dollars.—*Amer. Architect.*

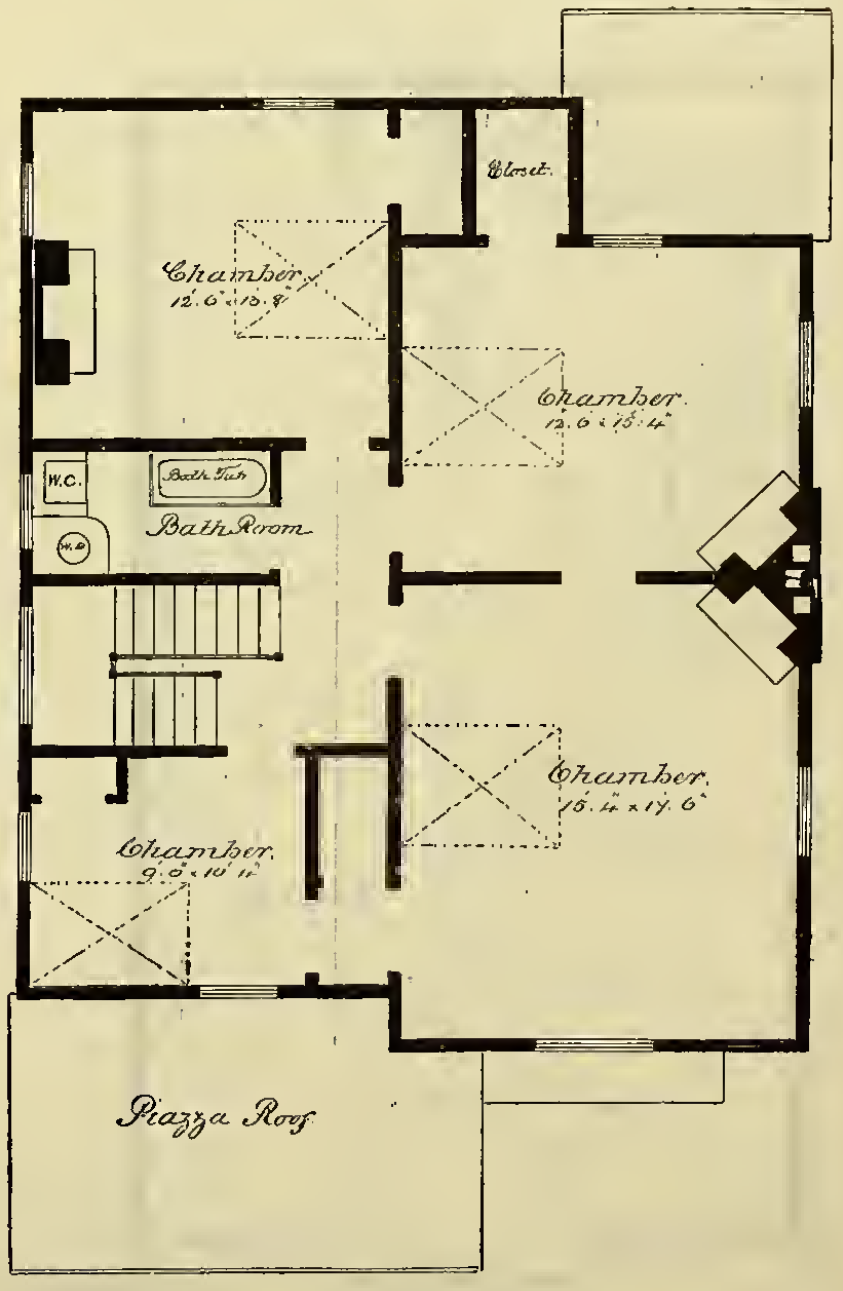
A COUNTRY STORE COSTING $2,000.

This building has front 22 ft. over all. Width of side over all, 38 ft. Height of stories (measured in the clear) is: First story, 10 ft. 6 in.; second story, 9 ft. 6 in.

Materials.—Foundation, 12 inch brick wall; first and second stories, clapboards; gables, shingles; roof, black slate. Has lately been erected near this city at a cost of $2,000, complete, without store fittings. Further information may be had at this office.



First Floor Plan.



Second Floor Plan.

A RESIDENCE COSTING $4,000.

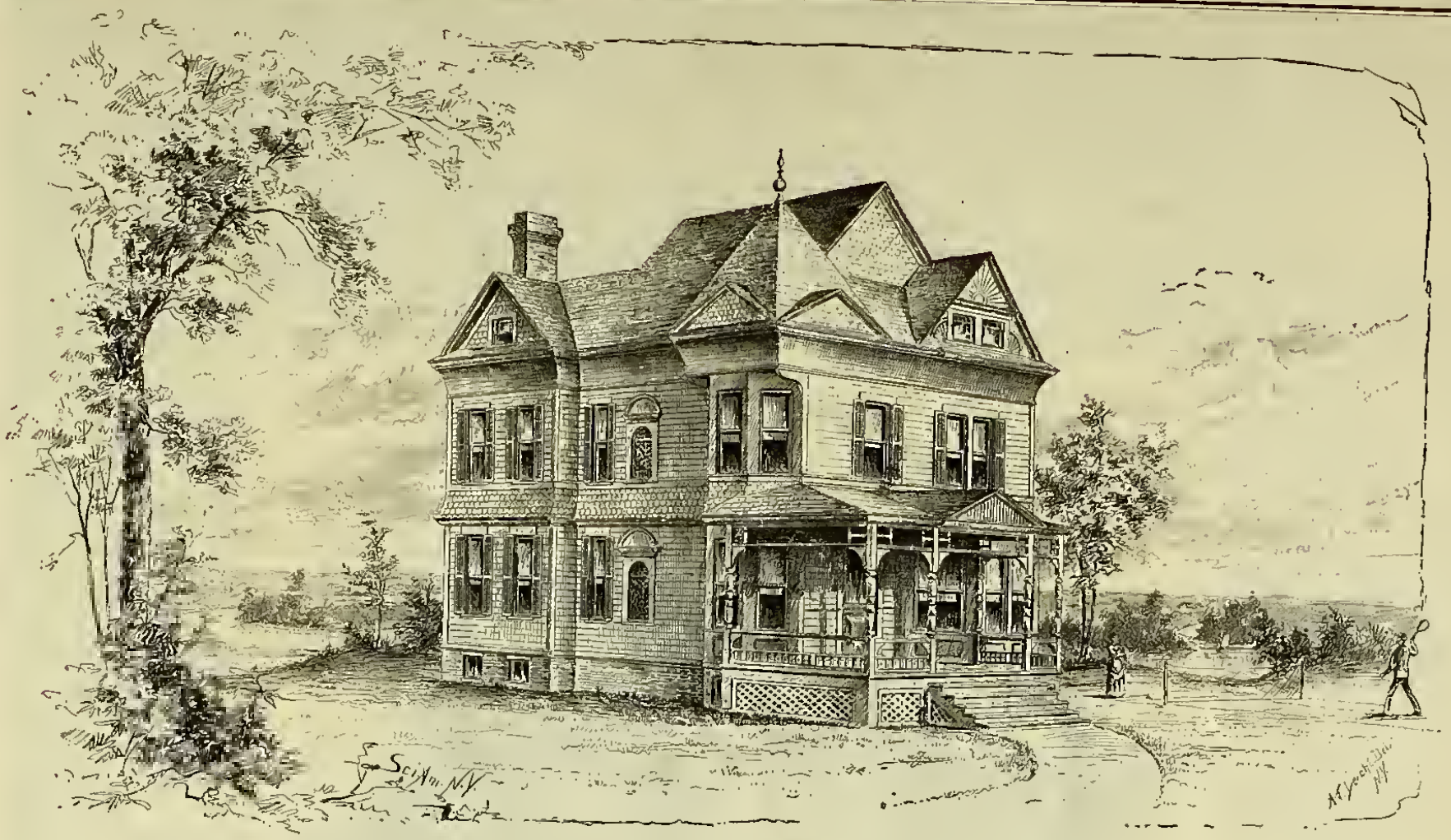
A RESIDENCE COSTING $4,000.

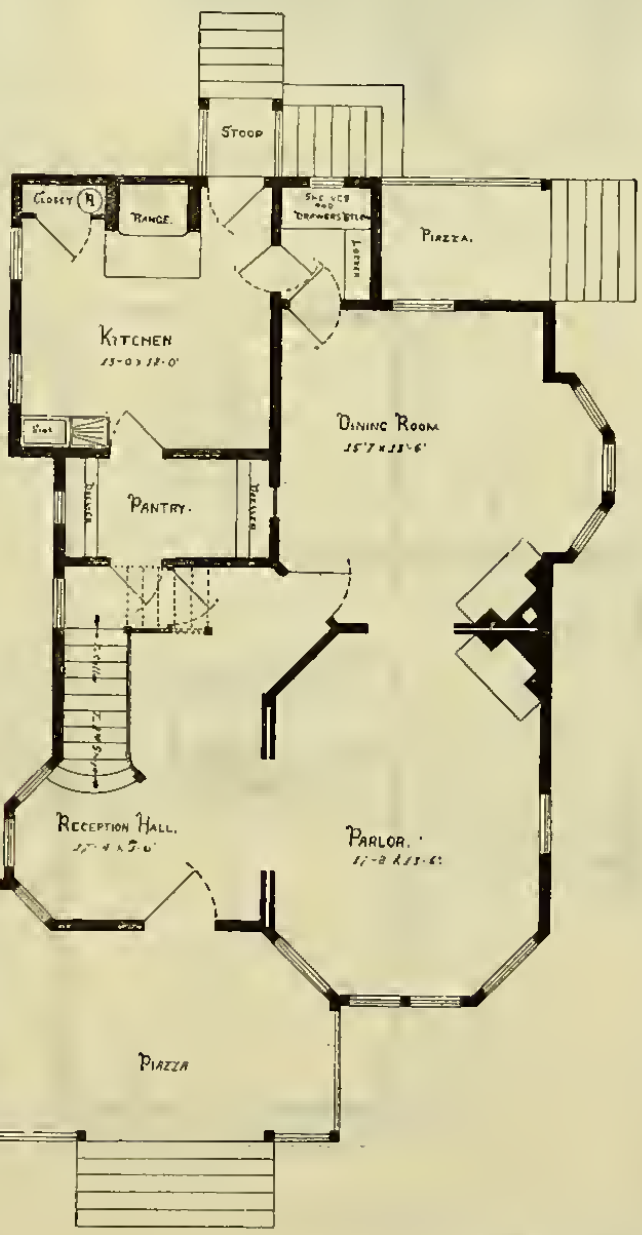
We give a perspective and floor plans. The building has a front of 30 ft Side over all, 36 ft. The floor plans show the sizes of the rooms. The height of stories (measured in the clear) is as follows: Cellar, 7 ft.; first story, 0 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

Materials.—Foundation, 18 inch stone wall; first story, clapboards; second story, shingles; roof, black slate.

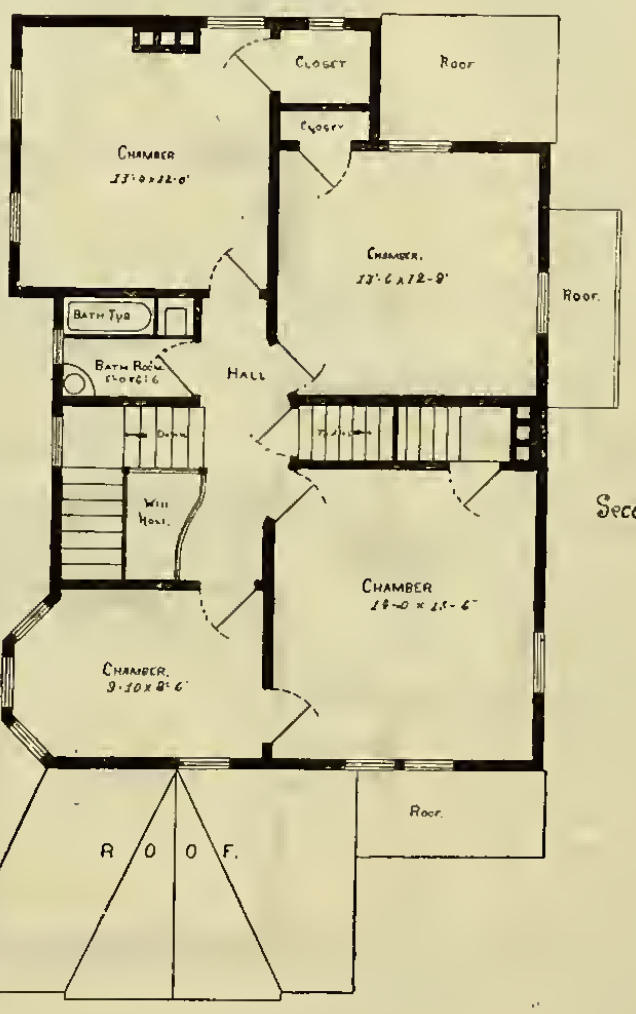
Cost.—Complete, all modern improvements included, except furnace, $4,000. If the attic is not finished, simply floored, there would be a saving of about $150. The cellar extends under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall. A back stairway leads from kitchen to platform of main stairs. The position of the stairway affords convenient access from kitchen to second story

Further information can be had by addressing Munn & Co., architects, 361 Broadway, New York. Plans, details, specifications, etc., for any of the buildings illustrated in this work may be obtained on very moderate terms, as above.





First Floor Plan.



Second Floor Plan.

A DWELLING COSTING $4,200.

A DWELLING COSTING $4,200.

We give a perspective of a house now nearly completed, near New York. It has a front of 24 ft., width over all 29 ft. 6 in., side not including veranda 40 ft. The floor plans give the sizes of rooms.

Height of stories (measured in the clear): Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

Materials.—Foundation, 16 inch stone wall; first story, clapboards; second story, clapboards; roof, black slate.

Cost.—$4,200, complete, except heater and range.

Special Features.—Cellar under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall.

If the attic is left unfinished, simply floored, there will be a saving of about $150.

Removing Grease from Boilers.

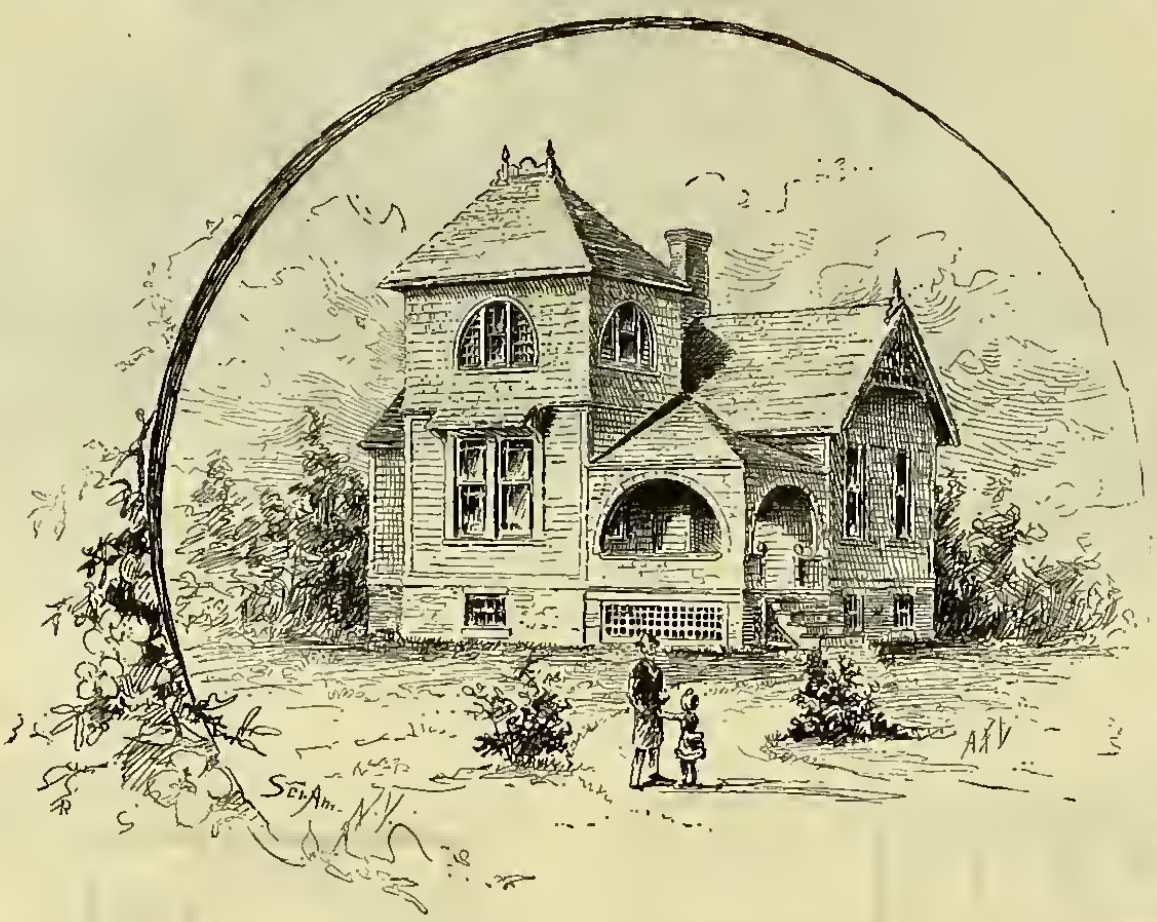
It is a very simple matter to clean out a boiler which has become greased upon the inside, if one knows how to go about it. *Grease* is insoluble in water. *Soap* is very soluble. Grease and soda combined form soap, which is easily blown out of the boiler. Therefore the easiest and simplest way to clean out a boiler which has become fouled up with grease is to dissolve a few pounds of soda ash or sal soda, from 10 to 25 pounds, in water, put it into the boiler, fill up with water, and build just a little fire, little more than enough to boil the water, raise say 3 to 5 pounds of steam, and let it run this way for a day or two. If enough soda was used, the boiler will be found, if blown off now, quite free from the adherent grease. It will only need to be washed out well to be in good condition. If there is any grease left, it is evidence that not enough soda was used, or that the boiling process might be continued for a greater length of time, and the operation should be repeated.

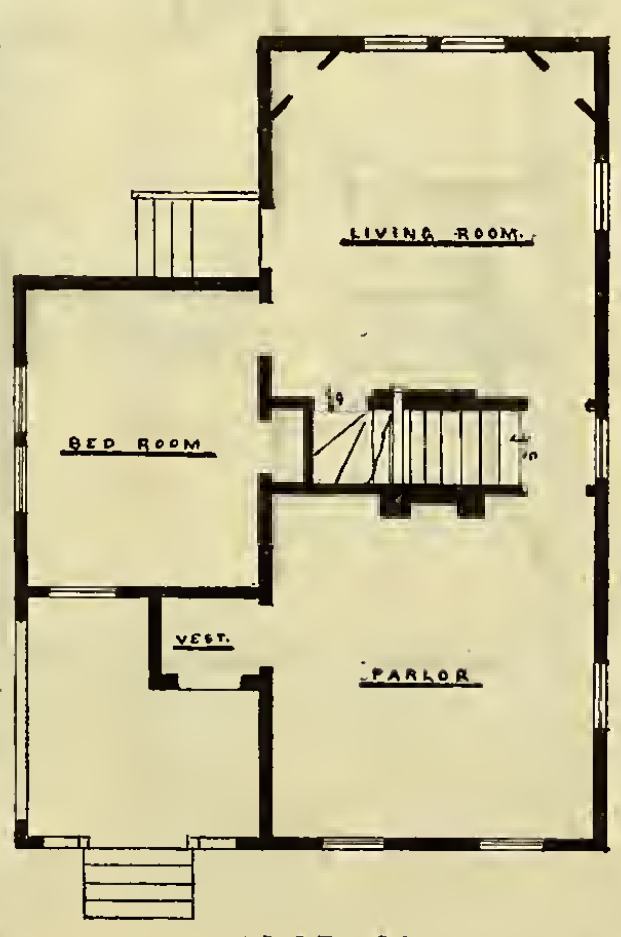
Of Food Economy before the American Association.

Professor Richards, of Boston, Massachusetts, gave a description of the cooking schools in that State. They found that such knowledge was best inculcated when the girls were taught at from 12 to 14 years of age. These lessons frequently resulted in such changes of cooking in the homes of the girls as manifested beneficial results in the manners, dispositions, and morals of the family. She advocated industrial cooking schools in connection with the public schools.

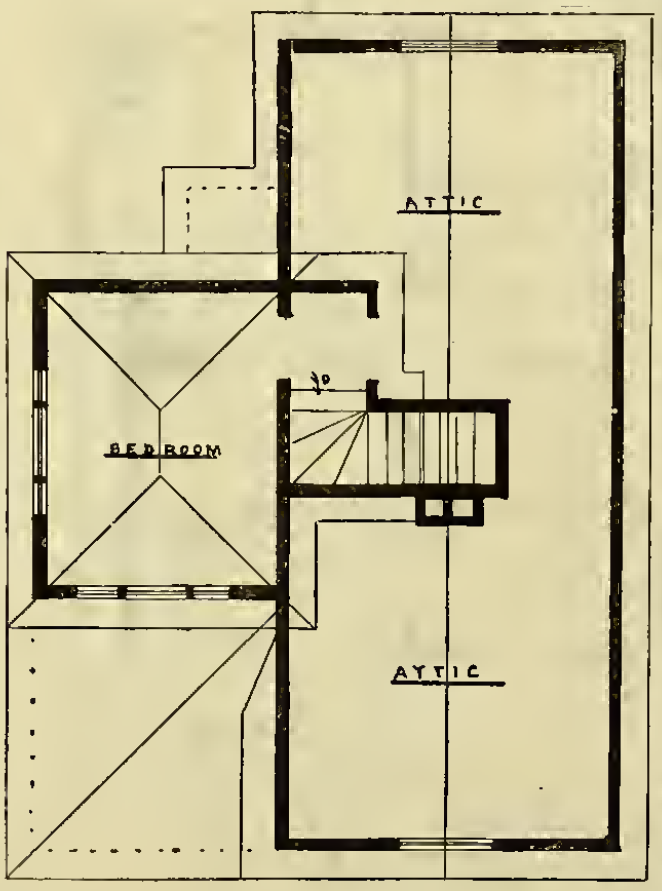
AN $1,800 COTTAGE.

Our illustrations show a design for a cottage sent to us by Mr. Geo. R. Madden, of West New Brighton, N. Y. It will he seen from the floor plans, drawn ⅛ inch to the foot, that the house has a front of 24 ft. All the rooms are of good size. Heigbt of first story 9 ft. 6 in. in the clear, second story 8 ft. Cost $1,800. This does not include furnace and modern improvements.





FIRST ST.



SECOND ST.

AN $1,800 COTTAGE.

Practical Use of Marble.

BY ARTHUR LEE.

The marbles of the whole world are to day at tbe disposal of the architect. The practieal question for his consideration is where and how to use them.

In northern climates the use of marble is almost entirely confined to indoor purposes. Tbe beauty of the colored marbles does not appear until they are polished, and no marble will retain a polished surfaee for long under exposure to the weather. As a general rule, therefore, marble is unfit for outside work. The principal exception is that of the hardest Sicilian marble. The beauty of this stone is not dependent upon its retention of a polished surface, and if due care is exercised upon its selection it will bear exposure very well. The best Sicilian for outdoor purposes is of a perfectly even texture and color, so hard as to emit a clear ringing sound when struck, and of highly crystalline formation. Veined Sicilian should never be used in situations in which it will be exposed to the weatber. A decided vein marks the line where disintegratiou will commence.

To make the most and the best of veined and colored marble, a great deal depends upon the way in which a block is cut. It should be so sawn that the figure is displayed to advantage. These marbles are, however, usually employed in thin sawn slabs, and a buyer has little difficulty in finding that whieh best pleases bis taste. With Sicilian and statuary, which are frequently required in masses and in block, the selection becomes more difficult.

Never select blocks in bright sunshine. The best time is on a elondy day after a shower of rain, and early in the morning. If a block can be "looked into" at all, it will be then. In selecting bloeks of statuary, a sharp lookout should be kept for yellow spots or veins; they are less likely to be noticed than blaek ones, which are more easily discovered. Much of the statuary imported from Italy is unfit for sculpture at all. It is very wbite, with a bright sparkling crystal and a taking appearanee; but it erumbles under the chisel, is of a soft sugary substance, and very quickly decays. The best blocks are hard and close grained, and if of uniform tint are none the worse for a slightly yellowish cast. Tbey work evenly under the cbisel, and are not too transparent.

The best white marbles of Italy are eminently suited for sculpture. In no other material is it possible for the conception of the artist to be reproduced in permanent form with sueh satisfactory result. The hardness of these marbles and the fineness of their grain give effect to the most delicate touches of the cbisel. The purity of white marble is in itself an aid to the grace and heauty of the composition. It has one distinct advantage over bronze or any materlal which requires to be cast. The last touches in marble are those of the artist himself. In all cast work they are perforce those of tbe founder and his men. Polisbed marble will not harmonize with a material which presents a rough surface. It does well with glazed tiles, burnished metal, and polished woodwork. It is very suitable for the ornamentation of fireplaces. For this purpose an unpolished stone is apt to become dirty, and tbe employment of wood is attended with danger. In all situations in whicb bare stone is left to be touehed or brushed against, marble is the only material to be tolerated. It is not enough for the architeet to see samples of the marbles whicb he means to employ. He should be eareful to inquire into tbe soundness of the material, and of the size of the blocks which can be proeured. He should also see samples which are of sufficient size to give a good idea of eolor and effect. Some marbles may be obtained in which color and texture are fairly average throughout large slabs or blocks. In others there is an entire difference in the space of a few inches.

Some marbles are only to be obtained in small blocks, and it is useless to speeify tbem for situations in which single pieces of large size are required. Some marbles are so full of earth cracks and vents that they are quite unsuitahle for any work in which they are required to give support, as, for instance, in the matter of columns. It is not long since that the columns of a new church built in Paris were constructed of a marble which was unfit for this particular purpose. The result was that even before the building was completed weakness was exhibited in the shape of several formidahle cracks in the columns, and in the end the whole of the work was taken down and rebuilt. A vast amount of trouble and disappointment may be saved by a little inquiry before a specification is decided upon.

It will be found tbat the adoption of this step will almost always result in a very eonsiderable saving of cost. Of two marbles which produce a similar effect, tbe one may cost in working three times as mucb as the other. In some situations it may be an advantage to build up intrieate mouldings out of thin slabs. Working out of tbe solid may mean the spoiling of a design or a cost which becomes probibitive. The seleetion of the marbles with wbich different parts of a design are to be carried out is of more consequence in the matter of eost than appears at first sight. Other factors being equal, it is well for tbe stone which is most easily manipulated to be employed in tbose portions of a design in which there is most work. Too frequently the consideration of these matters is left until after a plan is made and a speeification prepared. In such cases money is thrown away which migbt have been usefully employed in another direction, tbe work is altogether abandoned, or the inquiries which should have been made first are made last, at an expense of time and trouble which might have been easily saved.

The harder marbles afford excellent material for the construction of steps and staircases. A flight of marble steps is not only beautiful in appearance, but it is ealeulated to withstand an enormous amount of wear and tear. In seleeting marble for tbis purpose, it should be remembered that the effect of a flight of steps depends upon the regularity and evenness of the lines and tbe simple alternation of light and shade in the tread and riser. Colored marbles with strong markings or veins are not snitable. Tbe self-colored marbles or one of the dull gray varieties should be employed. The even color of Sicilian, Correblanchien, and of Istrian marbles makes them especially useful for this purpose. The effect which should be produced by a fine flight of steps is ruined by the employment of a marble in which the veins run obliquely and distort tbe horizontal lines, or in which waves of eolor disturb the effect of simple hreadtb of light and shade. These remarks apply equally to moulded work. Heavily veined marble destroys all the beauty of the lines of mouldings.

As far as possihle, work of this deseription should be carried out in plain black, white, or gray. Generally, finished work in marble is polisbed. The effect of reflection from a highly polished surface should be earefully borne in mind, otherwise it will be found tbat some members of a moulding will be completely obliterated in certain lights.

The variegated marbles should be reserved for flat surface decoration. Due care should be taken that the size of the panel or slab is sufficient to display the variety of the markings. If this is not done, half tbe beauty of the marble will be lost. In small panels, a marble which has close, fine markings should alone be nsed. The only exception to the general rule as to the employment of veined or variegated marbles is in the case of columns. The smooth cylindrical face of a column shows off the beauty of the markings as well as, or better than, a flat surface. If the columa is fluted, the objeetion to these marbles again returns in full force.

Marble may be most usefully employed for the paving of halls and passages, and of rooms in which much traffic is expected. A floor of marble mosaic is one of the most beautiful and at the same time one of the most durable which it is possible to construct. Marble tile floors are very common in churches and public buildings in Continental Europe. Their cost as compared with tiles made of clay has operated against their employment in England. Modern machinery and competition have now removed this obstacle, and marble tiles can be obtained which very little, if at all, exceed the cost of the ordinary encaustic tiles. If a clay tile pavement which has been much used is examined, it will be found that each tile is worn more or less hollow in the center. A similar traffic over marble tiles produces scarcely perceptible results.

Some most useful rules with respect to the employment of marble have been laid down by Mr. T. Graham Jackson. They are as follows:

"1. Decorative carving in marble—as, for instance, in cornices, capitals, and friezes, where high relief and bold design are required—should be severe and conventional. Naturalism is forbidden by the stubbornness of the material except in the highest subjects, such as the human figure, which repays the expense of labor, or else in very low reliefs, where the labor of execution is reduced within moderate limits.

"2. Sculpture should be in white marble, or if in alabaster, only in such as is free from veins or stains of color.

"3. Moulded architectural features, such as vases, bands, strings, cornices, arcbitraves, and abaci, should be either in white or some uniform color, without markings or veins.

"4. Variegated marbles should be used only for panels or columns, or, in other words, on plain, smooth surfaces, either flat or curved, so as to display the beauty of their markings to the utmost, without interfering with any of the structural lines of the architecture.

"5. Colored marbles should be used with moderation, too great a variety being avoided, and those of the quieter and more harmonious tones preferred for general use.

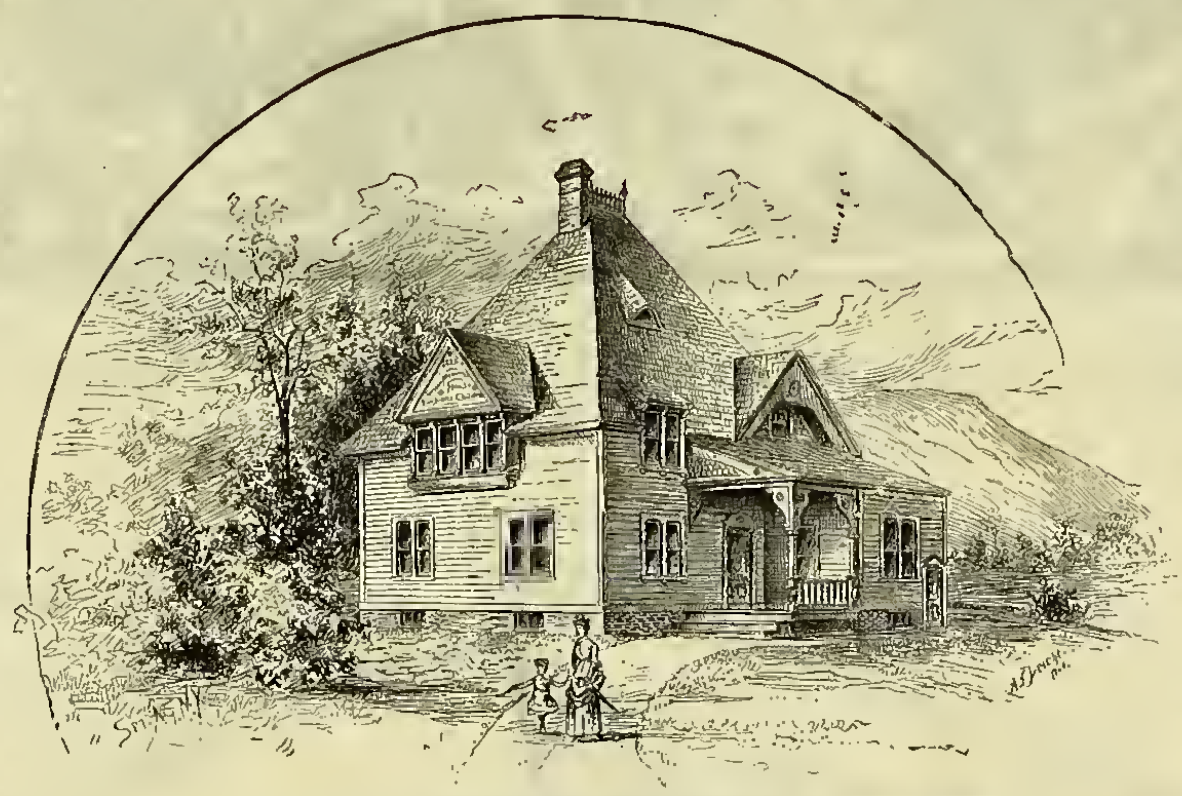
"6. Strong contrasts of color on a large scale are dangerous, and generally incline to vulgarity.

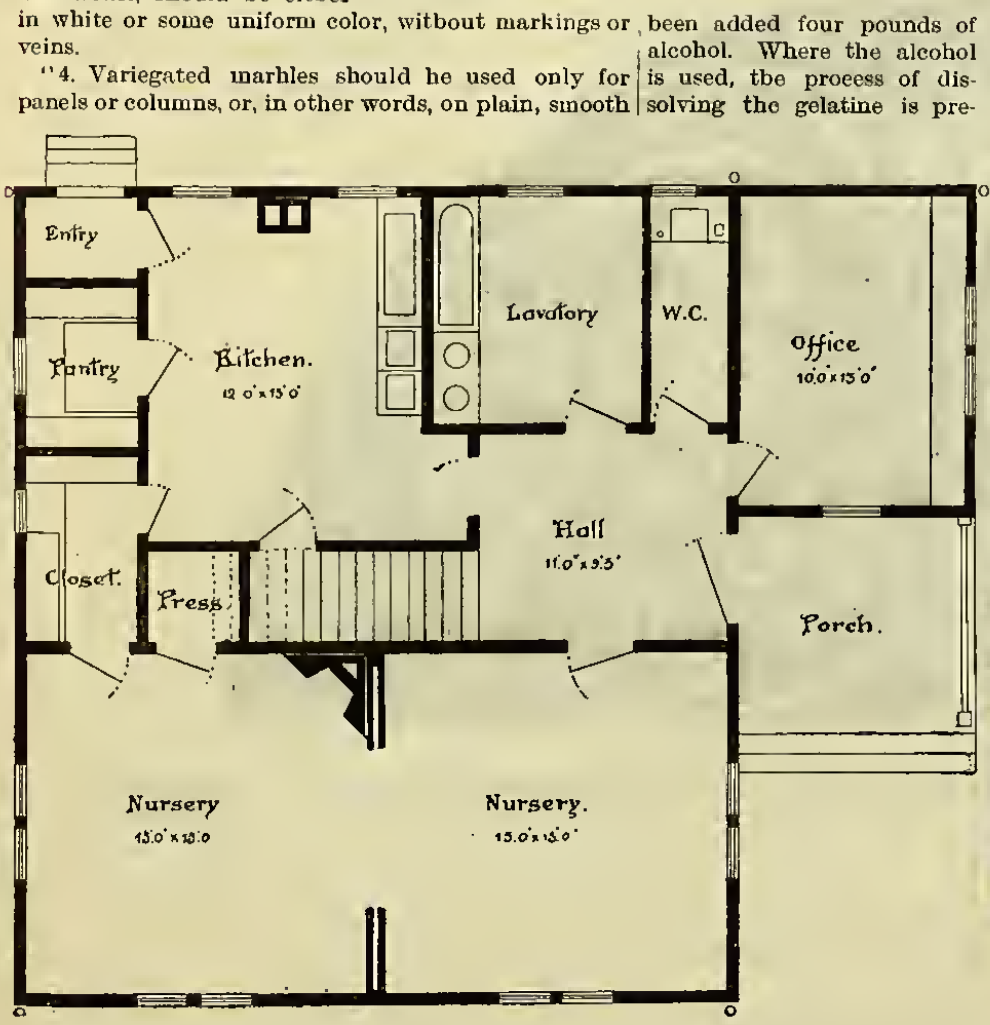
"7. Strong contrasts on a small scale, as in mosaics and inlaid work, are necessary.

"8. Stone and marble should be kept apart as much as possible."—*Building News.*

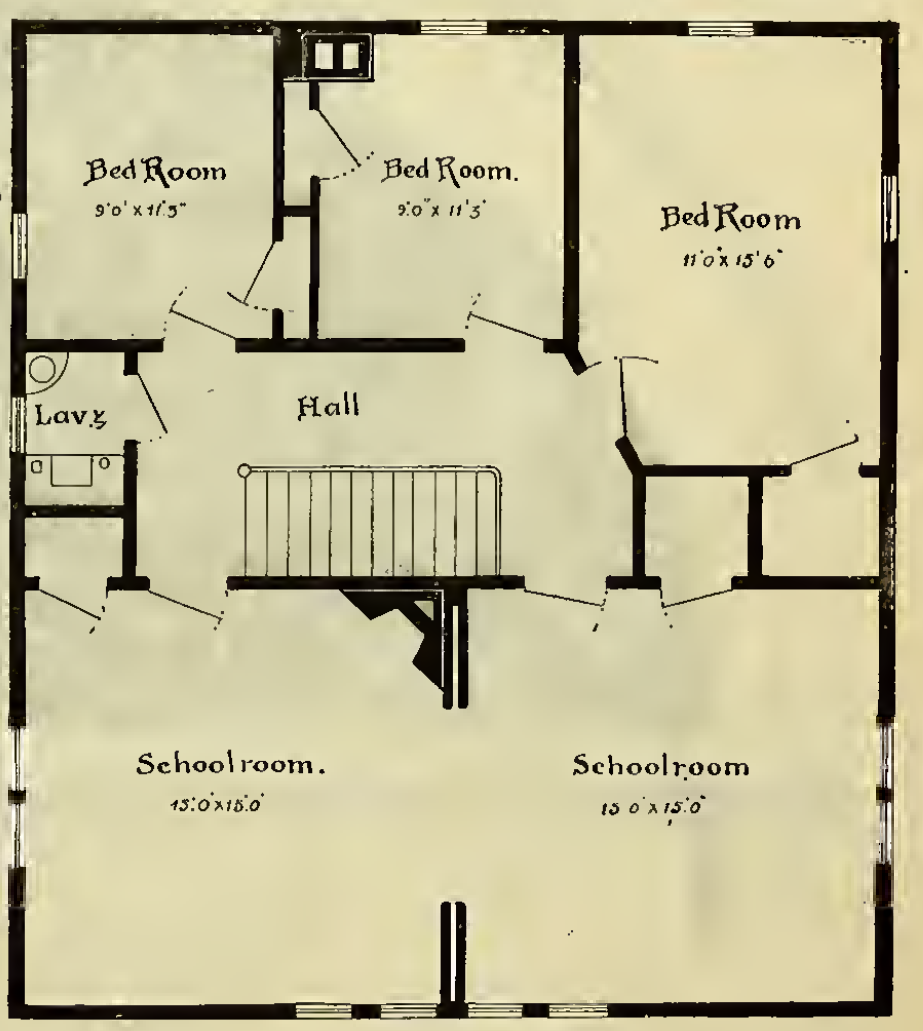
A SCHOOL HOUSE AND NURSERY.

We give illustrations of the Grace Memorial House, at Providence, R. I., a building designed for the special accommodation and instruction of young children. Edward I. Nickerson, Providence, architect. The estimated cost is $4,000.





Ground Floor.



Second Floor.

GRACE MEMORIAL HOUSE, PROVIDENCE, R. I.

A New Composition.

This is a new composition designed for use in the production of all manner of moulded objects of a useful and ornamental character.

The composition is made by taking ten pounds of commercial gelatine and dissolving it in about thirty pounds of water, to which, by preference, there has been added four pounds of alcohol. Where the alcohol is used, the process of dissolving the gelatine is preferably carried on in a close steam-tight vessel by the aid of heat. Dried raw untanned depilated animal skins, by preference rabbit skins, which have been cut into fine bits or strips, or reduced to shreds, are next taken and placed in about thirty pounds of hot water and thoroughly cooked and digested in a steam kettle until the water is evaporated from them and they are left in a soft, gelatinous mass. The reduced skins are then added to the hot solution of gelatine and thoroughly stirred therein, the solution being kept hot and well agitated in a steam kettle or digester. To this hot solution of gelatine and reduced skins are added about two pounds of Venetian turpentine, two pounds of linseed oil, and six pounds of resin or equivalent gum, and the mixture is then brought to the boiling point and kept at this temperature while being thoroughly stirred and agitated until all the foam and froth, which will arise therefrom, settles and disappears and the ingredients are fully combined and admixed, care being taken to prevent the boiling mass from running over during the operation.

When the compound is properly prepared, twenty pounds of paper pulp are added, and the mixture is beaten by means of dashers or other appliances for the purpose until the whole is reduced to a slimy mass of uniform consistency; and, finally, to this viscid mass there is added sufficient pulverized alabaster or marble dust or equivalent pulverulent mineral matter to bring it to about the consistency of soft putty, the thorough admixture and incorporation of the pulverulent substance in the mass being produced by kneading it and working it as dough with the hands or by means of any known mechanical devices for the purpose. The plastic composition thus obtained may then be laid in a thin coat upon a sheet or web of fibrous material or textile fabric and carried between two metallic compressing rollers, one or both of which are either plain or engraved or embossed with any desired pattern, which will operate to firmly unite the composition to the fibrous web, or it may be moulded in suitable moulds into useful and ornamental figures and shapes of all varieties.

When formed in plain sheets, the sheets may be placed under dies which shall operate by pressure thereon to emboss the surface with any desired pattern. The sheets, plates, or objects thus formed of the plastic composition are finally allowed to dry and harden, and will then be both waterproof and fireproof. The hardening process is usually completed under ordinary atmospheric influence within twenty four hours.

The product is said to be admirably adapted as a covering for walls in the place of paper, and its application to the purposes of decorative art admits of infinite variety and modification.

TO DISTINGUISH IRON FROM STEEL.—By breaking and comparing crystallized surface, steel will show a homogeneous, granular surface; iron will show a streaky or fibrous surface.

GRNAMENTAL PANEL GF A GOTHIC ALTAR IN THE CHURCH GF ST. EGIDIEN, IN BARTFELD, HUNGARY.

FANLIGHT GRATING IN A HGUSE IN BOTZEN, AUSTRIA.

SUGGESTIONS IN DECORATIVE ART.

The Ideal House of the Future.

There is no doubt that the ideal house of the future, whether large or small, will he in the country, and that this massing together of humanity to he found now in our great cities will come to he considered simply barbarous. Even for the rich, who can claim fullest space the city, with its undercurrent of crowded, festering, noisome life, holds contamination; while for the poor themselves, what word is strong enough to express the degradation of the word home that is theirs!

Nor is it possible, even under the most favorable circumstances, to count "flats" or apartments as anything more than the travesty of comfort in its best sense. Ruskin is right when he denies to cities any possibility of the best development for human life; and though they have their uses, and we could ill dispense with many good things to which they have given birth, they are responsible for such hideous evils that one longs at moments to see them, their pride and their magnificence, and "the bitter cry of outcast" life in their midst, engulfed like those lost cities of old.

The home spirit is strong in many a city flat, and consecrates many a stately mansion as well as the narrowest tenement; but the true home must be in the country, quite accessible, it may be, from the city, but always owning certain indispensable and inalienable characteristics. The house that has not its own bit of land, its own possibilities in the way of garden or orchard, even if that orchard sum up as only one old apple tree, has not the right to the title "comfortable." Building associations all over the country are making building possible for even very limited incomes, and these associations are supplemented by work from our architects that gives us every form of inexpensive design, and proves that beauty and cheapness can go hand in hand.—*Cosmopolitan.*

The cause of single and double rainbows is due to the combined reflection and refraction of the sun's rays from drops of rain. The rain must be on the side away from the observer. The position of the rainbow depends on the height of the sun, and rain drops at different definite elevations can produce the effect, so that double or triple rainbows are possible.

A SEASHORE OR BEACH HOUSE.

We give from *Building* a very pretty sketch for a seashore residence. It is picturesque, roomy, has a spacious piazza, and presents several other attractive features. The cost for such a dwelling would be about ten thousand dollars.

Exhibition of Building Materials, Brussels.

A leading feature in the programme of the Belgian Society of Engineers and Manufacturers is the holding of special exhibitions, of which, besides the loan collection of M. De Lesseps' plans and models of the Suez and Panama canals, four have already taken place, viz., iron and steel permanent way for railways and tramways; methods of illumination, retrospective and actual; India-rubber and its applications; and telephonic apparatus. These have been held in the society's hall, forming part of the Brussels Bourse; and lectures connected with the subject of exhibition or individual exhibits have been given on Friday evenings. Such has been the interest attaching to these exhibitions, that latterly they have been open to the public at a small fee.

The fifth exhibition, which remained open until the 19th June, was devoted to building materials found or made in Belgium, but excluding the metals, and has drawn together a large number of materials a few of which merit notice on account of their interesting character or novelty. The Belgian marbles, which are largely exported to England for mantel pieces, are well represented, the Societe Anonyme de Merbes-le-Chateau sending no fewer than twenty specimens. It may be mentioned, incidentally, that it is chiefly the red varieties, of which the Rouge Royal is a type, that are known in England; but the black with white veins also merit attention.

Specimens of the principal Belgian marbles, prepared like microscope subjects for studying the origin and structure of the Devonian limestones, have been lent by the director of the Brussels Natural History Museum. They are only one-tenth of a millimeter thick, and have been prepared by grinding one face perfectly true and smooth, and cementing a glass plate to it, the other side being ground down to the desired thickness, and also protected by a glass plate. Placed in vertical frames, the specimens may be examined, with the aid of the magnifying glass, by looking through them toward the natural or an artificial light.

The floor shown by Damman and Cassard consists of shallow concrete arches turned between light rolled iron or steel joists, the concrete having internal dovetails left in its upper surface, which is made flat, and completely covers the joists. Over this surface liquid asphalt is poured, and while it is still hot the pieces of wood forming the *parqueterie* are bedded in it. Grooves are made in their longitudinal lower edges, two of them forming together an internal dovetail, so that when the asphalt sets it securely clamps the wood down to the concrete. The floor thus produced is solid and noiseless, while at the same time being sound proof, damp proof, and practically fire proof. A modification of the above, in which the *parqueterie* pieces are connected with asphalt to tiles having a conical hole in the middle of each, has been laid down at the Hotel de Ville, the Palais de Justice, and the Palais de la Nation, Brussels.

The Societe Anonyme des Fours de Laeken makes hollow slabs of plaster of Paris for filling up the space between two rolled joists. The Societe Anonyme des Deux Nethes accomplishes the same object with *hourdis*, or slabs made of burnt clay, hollowed out in the direction of their length, and provided with longitudinal ribs or feathers for strength. Leon Champagne et Cie make for this purpose *voussettes*, or hollow bricks approaching in form to that of the wedge, which they claim to be quite as efficient and less costly.

Picha Freres, of Ghent, strengthen all their articles made of cement with a stout iron wire framework inserted in the middle during their formation. Renette et Cie, of Ghent, sink wells in sandy soils with the aid of hollow cylinders composed of concrete, coated and lined with cement, which not only prevent accidents due to earth falling in while sinking, but also secure a pure supply by intercepting surface water. In sinking a well, the ground is first leveled, and then the bottom ring, having its lower edge splayed out and beveled, so as to sink easily and make a way for the rest, is laid upon the surface. The earth inside is then excavated, when the ring sinks by its own weight. When its top is level with the surface, another ring is added; and the socket joint is cemented, so as to be water tight. This process is continued until water is reached, when a special dome-shaped ring with aperture is placed on the top, without, however, being cemented, in case it should afterward be found necessary to deepen the well.

A new roofing substance is shown by E. Perret, of Vilvorde, in his "unalterable cloth" for superseding the so-called bitumenized felt, which soon becomes disintegrated under a hot sun. The flax tissue is impregnated and coated with a bitumen derived from petroleum, to which are added small quantities of natural bitumen, resin, and chalk; and the upper side is sanded to prevent adhesion when the cloth is rolled up. The cloth is laid on battens, or on the rafters, which may be 12 or 15 inches apart, the lower portion of a sloping roof being covered first with a continuous length. Another length is then laid above, with a 3 inch lap, and so on till the roof is covered, the upper length being folded over the ridge. The cloth is held down by washers of the same secured by zinc nails, and requires no coat of tar or other substance.

A new drying oil for house painters, to take the place, at half the cost, of linseed oil, driers, and turpentine, is prepared from petroleum by Rave, Annez et Cie. Besides the lower cost, the special advantage is that the oil dries so quickly that several coats may be applied in a day—a matter of great importance when a temporary structure is required in a hurry. It is asserted that the oil will unite chemically with all paints except white lead, which may be replaced by zinc white, and chrome yellow, for which Naples yellow may be substituted. It is also claimed that this is the only oil that may without difficulty be laid on cement and combine with it, and through which tarred or bituminized surfaces will not show.—*Jour. Soc. of Arts.*

FULL drawings, details, and specifications, ready for the builder, for any of the buildings illustrated in this publication, may be obtained at this office on moderate terms. Munn & Co., architects, 361 Broadway, N. Y.

Chimneys of the Ancients.

It has by some been considered doubtful whether the Greeks and Romans, during the period of their greatest eminence for architectural productions, had any chimneys in their dwelling houses; but as Homer, Aristophanes, Virgil, and Appian are supposed to mention or make allusion to them, it has been inferred by other writers that they were not wholly unknown to those ancient builders. The oldest certain account of the use of chimneys is stated to be 1347, and it is conjectured they were invented in Italy. Smoke-jacks, which must have been invented subsequently to chimneys, are supposed to be of German origin; and, from a painting which is known to be older than 1350, it is supposed they were in use before that period. In the houses discovered at Herculaneum and Pompeii, there are, it is said, no chimneys; but they appear all to have been warmed by means of flues and a subterraneous furnace. Stoves and flues, it is thought probable, were introduced about the time of Nero. Seneca relates that, in his time, there were invented certain tubes, which were placed in the walls, by which the heat of the fire was made to circulate and warm equally the upper and lower apartments. These observations have been quoted as proofs that chimneys were unknown at those periods, but have they not a contrary tendency? It appears more probable that a chimney should furnish the idea for such stoves than the use of stoves should be known before chimneys. In the Old Testament there are several allusions to furnaces for the smelting of iron and other metals, which would appear to leave no doubt of the use of chimneys being known at a very early period, especially to the Egyptians (see Gen. xvii. 15, Deut. xx. 4, and Ezekiel xx 22). In Nehemiah, the towers of the furnaces are spoken of. In the First Book of Samuel, xxx. 30, a city is called the smoking furnace (Chor Ashan), probably from the number of chimneys erected in it. The Arabic root renders the word "round;" they were, no doubt, built in the form of a round tower of lofty height, like some of the chimneys of manufactories at the present day.—*Seth Smith.*

A SEA-SIDE DWELLING.

Preservation of Wood by Lime.

I have for many years been in the habit of preparing home-grown timber of the inferior sorts of fir—Scotch, spruce, and silver—by steeping it in a tank (that is, a hole dug in clay or peat, which was fairly water tight) in a saturated solution of lime. Its effect on the sap wood is to so harden it and fill the pores that it perfectly resists the attacks of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I have a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation. The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution from two to three months, by the end of which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two to three months' steeping is sufficient if the scantlings are cut to the sizes at which they are to be used.—*Field.*

TENEMENT HOUSES OF MODERATE COST.

We give herewith illustrations of some tenement houses of pleasing appearance and moderate cost at Kansas City, for which we are indebted to the *Northwestern Architect*. We estimate the cost of these houses, in this vicinity, at $20,000 for the three. These buildings occupy a frontage of about 100 ft. by 50 ft.

Vermont Marbles.

BY ARTHUR LEE.

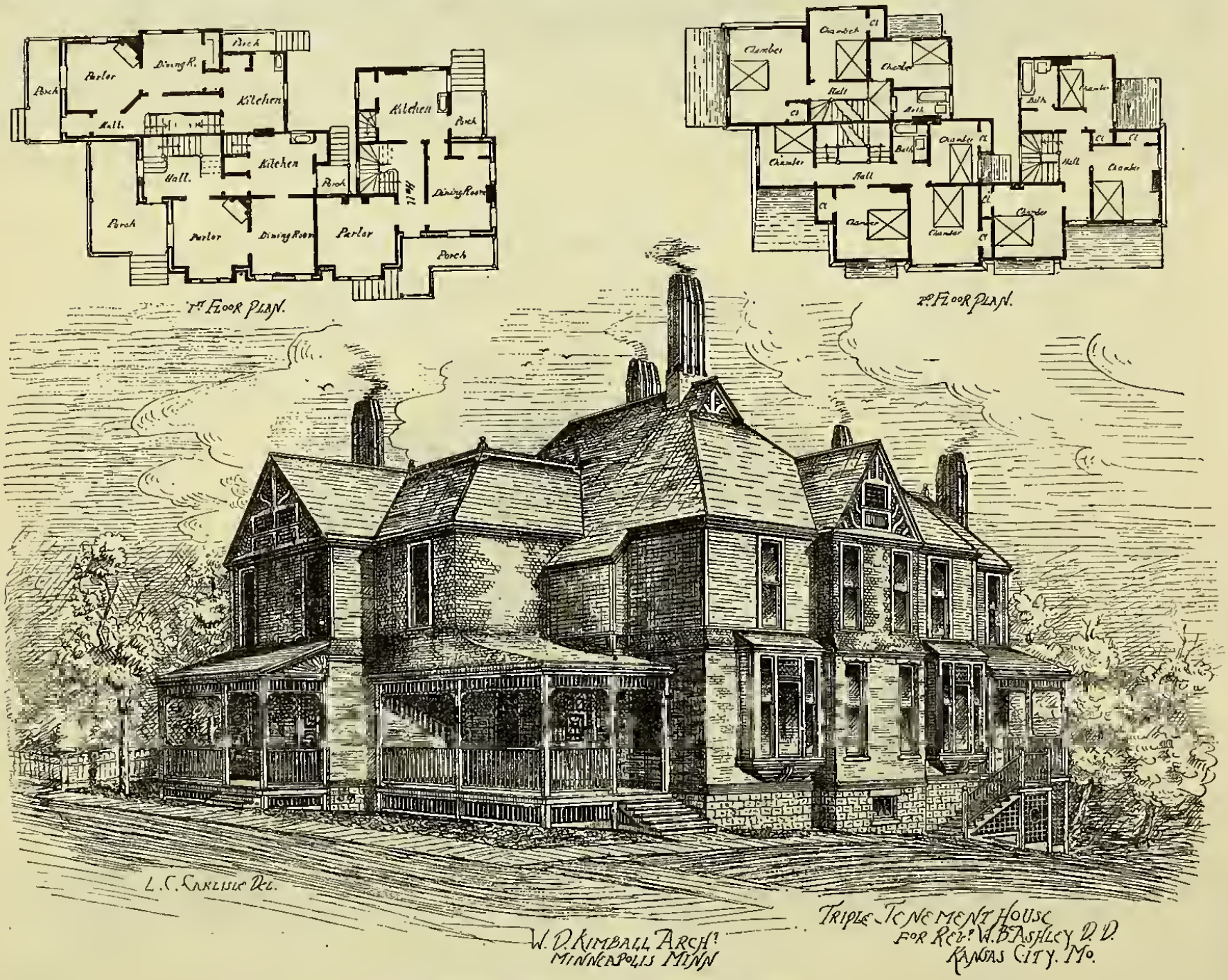
The rise and progress of the marble trade in the United States of America has been of a most extraordinary character. The first marble quarry in the country was opened in Vermont in 1785. Shortly before the year 1800, works were erected for the sawing of marble at Marbledale, near New Milford, Connecticut. It is said that the first tombstone made out of American marble was erected in 1799, and was the work of one Jonas Stewart, a marble cutter of Dorset. An examination of the headstones in the graveyard at New Milford proves that the oldest of them are of sandstone from the Connecticut Valley, and of slate Those of somewhat later date are of marble, and have been evidently worked by hand from the rough block. Those bearing a date soon after the beginning of the present century have been cut on one or both sides with a saw. The date of the first working of American marble is, therefore, fixed with tolerable certainty, and it is evident that a trade which has now assumed enormous proportions has been built up in less than a century.

Marble is now used for building purposes in the States on a scale which may astonish the architects of the Old World. In New York it is superseding the brown freestone or sandstone of which such a great part of the city is built. The great bulk of the trade centers in Vermont. In that State the quarries are worked with every mechanical means which the ingenuity of man has been able to devise. In the year 1882 it was calculated that the capital invested in the production of American marble in the States of Vermont, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, and Tennessee was £2,500,000 sterling, two thirds of which was invested in quarries and one third in mills and machinery. The number of workmen engaged was 6,00 ', and the annual production amounted to 2,200,000 cubic feet, valued at £900,000.

The principal workings in Vermont are at Sutherland Falls, Rutland, and Dorset. The Sutherland Falls marble is mottled and veined in a manner peculiar to itself. Some of it is dark, with a ground of deep blue, with nearly black veins. Another variety is nearly white with clouded veins. Both descriptions are sound, and take a good polish. Quarrying operations were commenced in 1836, although they were not pursued with much spirit until some years later. The quarries are well situated, above the railroad and mills, so that blocks are readily transported. The falls of the Otter are made use of as a motive power to drive the saws, the polishing beds in the finishing shops, and the drills in the quarry. It was here that the first successful channeling machine was employed. These machines are now in operation all over the States. It is calculated that since 1863 over five millions of square feet have been cut by them. The channeler is a locomotive machine which runs on steel rails placed on the quarry floor. The gang of cutters forming the drill is composed of five steel bars, 7 ft. to 15 ft. long, sharpened at the ends, and securely clamped together. The center cutter is the longest, and the two outside cutters are the shortest, so that the five form a kind of stepped arrangement away from the center. As the machine runs backward and forward over the rails the cutters deliver their strokes at the rate of 150 per minute. Deep, narrow furrows are cut into the solid stones, and long parallel blocks are thus formed. Close after the channeler runs the gadding machine. This drills circular holes along the bottom and sides of the blocks, into which wedges are introduced, and the stone is split from the bed. The Wardwell channeling machine, which is most commonly in use, cuts a continuous groove at the rate of 75 to 150 square feet per day, thus doing the work which could be done by 50 to 100 men by the old hand process. The expense of working the machine is about £2 per day. The advantages gained by use of the machines are therefore obvious. The diamond gadder does its work at the rate of about 180 ft. per day as against 12 ft. by hand labor. Three men are required for each channeler and two for each gadder. As a consequence of this mode of getting the stone, the quarry appears like a hollow cube cut into a hill. The sides are nearly perpendicular walls, and the bottom is a marble floor over an acre in extent. Across this floor the channeling machines work.

Sutherland Falls marble is much used for building purposes. The spire of Grace Church, New York, is built of it. The formation of the beds gives great facet that the principal supply has hitherto been produced from the upper layers. It is now claimed that the lower layers have produced a statuary which is of a much better texture than any formerly worked. At the State House in Montpelier there is a statue of Ethan Allen of heroic size; this is the work of Larkin J. Mead, and is sculptured out of Rutland marble. The marble is certainly not so easy to work as that of Italy; it is what is called "plucky"—that is, given to breaking away before the chisel, unless great care is used.

The sand blast was first employed for the cutting of marble at some marble works in West Rutland in 1875–76. A contract was taken by which 254,000 lettered headstones, having dimensions of 3 ft. in length, 10 in. in width, and 4 in. in thickness, were placed in the national cemeteries at an expense to the government of about £173,000. The monuments were for the purpose of marking the graves of soldiers, and the application of the sand blast for the purpose of cutting the inscriptions enabled the work to be so cheaply done. Letters and figures of chilled iron were placed on the stone to be cut, and the blast was then turned on; the portions of the stone unprotected by the iron were eaten away by the force of the blast, and the inscriptions were left standing in relief. By this me-



TENEMENT HOUSES OF MODERATE COST.

thod the name, company, regiment, and rank of a soldier could be put upon a stone in less than five minutes of time.

Between Rutland and Sutherland Falls there is found the quarry of the Columbian Marble Company. This marble is almost black, but with a mottled surface; it is much used for mantelpieces and monuments.

At Pittsford there are three beds or veins of marble which run through the town north and south. The east bed is of the same character as Sutherland Falls marble, of which bed it is probably a continuation; the middle bed is separated from the easterly one by about 200 ft. of limestone rock. This bed is about 400 feet wide, and contains marble of all shades, ranging from white to dark blue. Marble from the Pittsford quarries has been used in the construction of several large buildings at Boston—notably the Continental building, Commonwealth hotel, and the Blackstone National Bank building.

About a mile to the south of Pittsford some marble is quarried known as "Florence marble." It is dark blue in color, mottled and veined. The quarries were first opened in 1880, and the production rapidly assumed large proportions. In 1884 it was calculated that the output was nearly 10,000 tons.

Another dark, dove-colored marble is found at Brandon. Several quarries have been opened near this town, but only one is now in active operation.

At Middlebury there are extensive deposits of white marble, which some years ago were very largely worked. Little in this way has been done of late, as the marble, although of good color, has proved to be so generally unsound that the working of it has not been remunerative.

The first attempt to manufacture marble upon a large scale which was made in the States originated in Middlebury. In a history of this town by Judge Swift, there is an interesting quotation from a pamphlet written by Professor Frederick Hall, and published as long ago as 1821, which is as follows:

"Proceeding down the creek on the western side, after passing two sawmills, two grist mills, a clothier's works, and some other establishments of minor importance, you come to the marble factory. The marble of this village, which is now wrought on a large scale, and is extensively approved over the country, was discovered by Eben W. Judd, the present proprietor, as early as 1802. A building on a limited plan was erected, and machinery for sawing the marble was thus put in operation. In 1806 a new and commodious building, two stories high, and destined to comprise sixty saws to be moved by water, was erected. In 1808 this enlarged establishment went into operation, and has continued to the present day.

"The saws are made of soft iron without teeth, and are similar in form to those which are used for sawing marble by hand in the large cities in Europe. The marble until lately has been obtained chiefly from a quarry situated within a few feet of the mill. It is raised from its bed partly by means of wedges, but principally by blasting. The marble, after being sawed into slabs, is manufactured into tombstones, curriers' tables, panels, mantelpieces, hearths, window and door caps and sills, sideboards, sinks, and various other kinds of furniture. These articles are transported to Montreal, Quebec, Boston, New York, and even Georgia. The machinery has sawn annually from five to ten thousand feet since the year 1808."

At Larrabee's Point, in Shoreham, Addison County, there are deposits of black marble which closely approach Kilkenny marble in appearance. The quarries are not now in active operation, but several polished chimney pieces made of it are to be found in some of the older houses in the neighborhood. At one time it appears to have been in much favor.

La Motte marble is another black marble of similar character, but more fossilized. It is found near the west shore of the island of La Motte in Lake Champlain. It is in considerable demand for the making of flooring tiles, and finds some employment for monumental purposes.

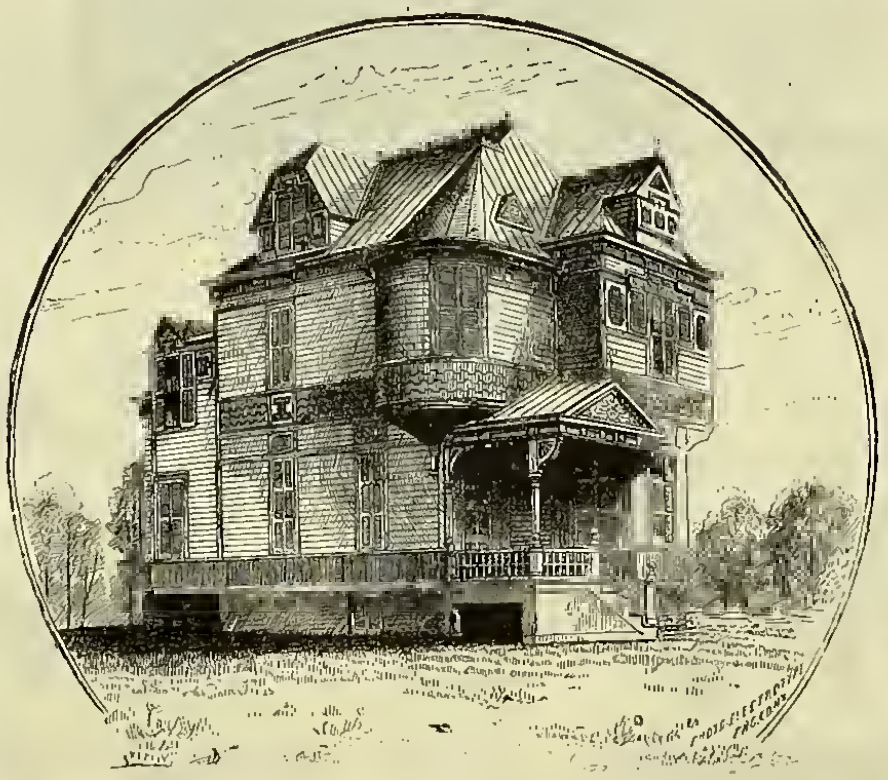
At Swanton, in Franklin County, there is found a dove-colored marble, which was much used for gravestones down to the year 1850. In that year the working of it was abandoned, as the quarries could not compete with those opened at Rutland.

South of Rutland the celebrated Dorset marbles are found. These are situated near the town of that name, in Bennington County, Vermont, and are, for the most part, worked in the sides of Dorset Mountain or Mount Eolus. This is a mountain of marble with a cap of slate on the top. The slate is estimated to be 498 ft. in thickness and the limestone and marble 1,970 ft. Some 200 ft. below the slate, white marble, used for building purposes, is quarried, and 400 ft. lower a fine-grained white marble is found, which is in great request for monumental purposes. The first quarry was opened in 1785 and sawmills were erected in South Dorset in 1818.

Before that date the stone was taken from the top or outer edge of the layers, where the strata could be readily split into flags of a thickness of some four or five inches. These flags were then worked up into the required shape with mallet and chisel. When once sawing plant was in full swing, the harder layers of stone were worked, and the sawn marble found a ready market. In 1840, before the introduction of Italian and Rutland marble, the demand for Dorset marble was beyond the supply.

What is known as Vermont Italian marble is worked up the mountain at East Dorset. This marble is almost exclusively used for monumental and decorative purposes. The production reaches an annual average of over 30,000 cubic feet.

A quarry known as the Freedley Quarry, situated a little further to the north, has been worked since 1820, and is still producing a white marble, much used for building purposes. The quarry is high up in the mountain, and the blocks are sent down by means of an inclined railroad. The annual production of the Freedley quarry averages 40,000 cubic feet.—*Building News.*



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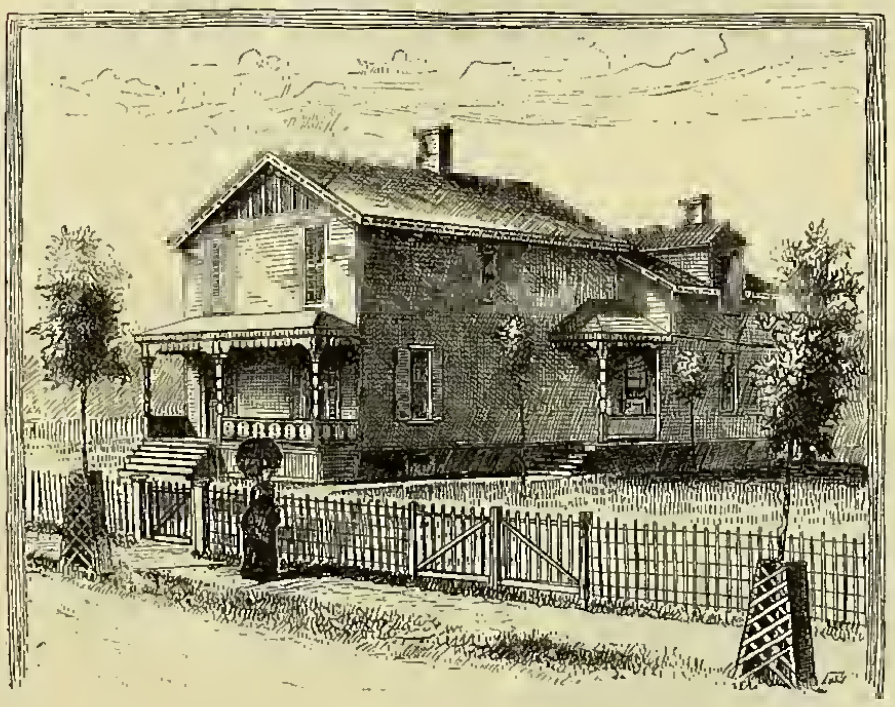

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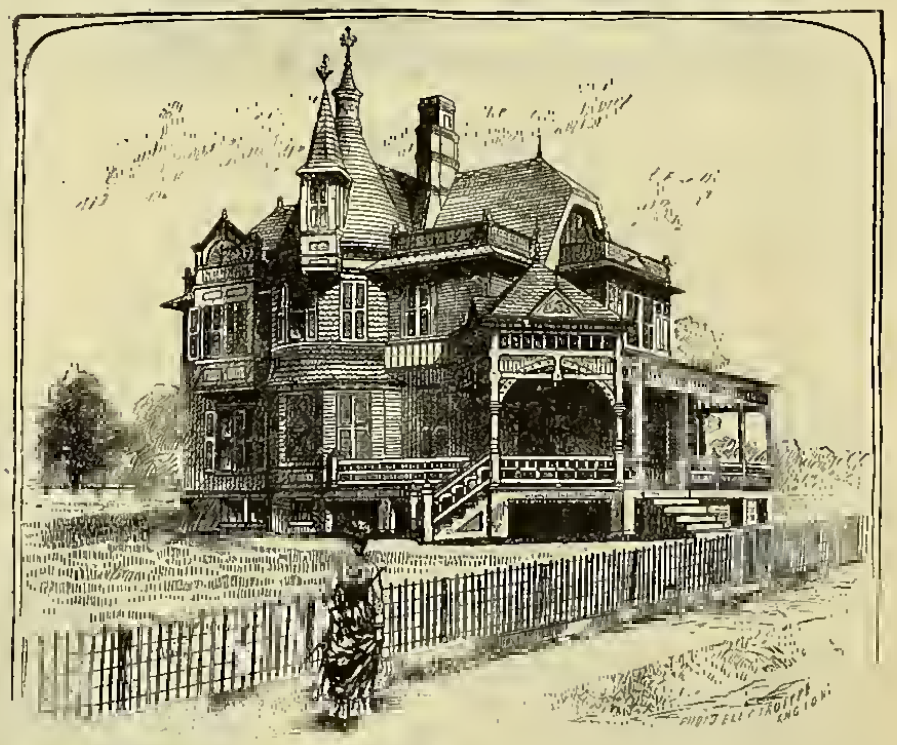


No. 3.

EXAMPLES OF SUBURBAN HOUSES AT HAMILTON HEIGHTS, FORT HAMILTON, N. Y.

SUBURBAN HOUSES.

We give from the *Real Estate and Builders' Monthly* three designs for dwellings of moderate cost. No. 1 may be erected in this vicinity for about $4,200; No. 2 will cost about $3,200, and No. 3, $5,200.

Snow Sheds on the Cascade Mountains.

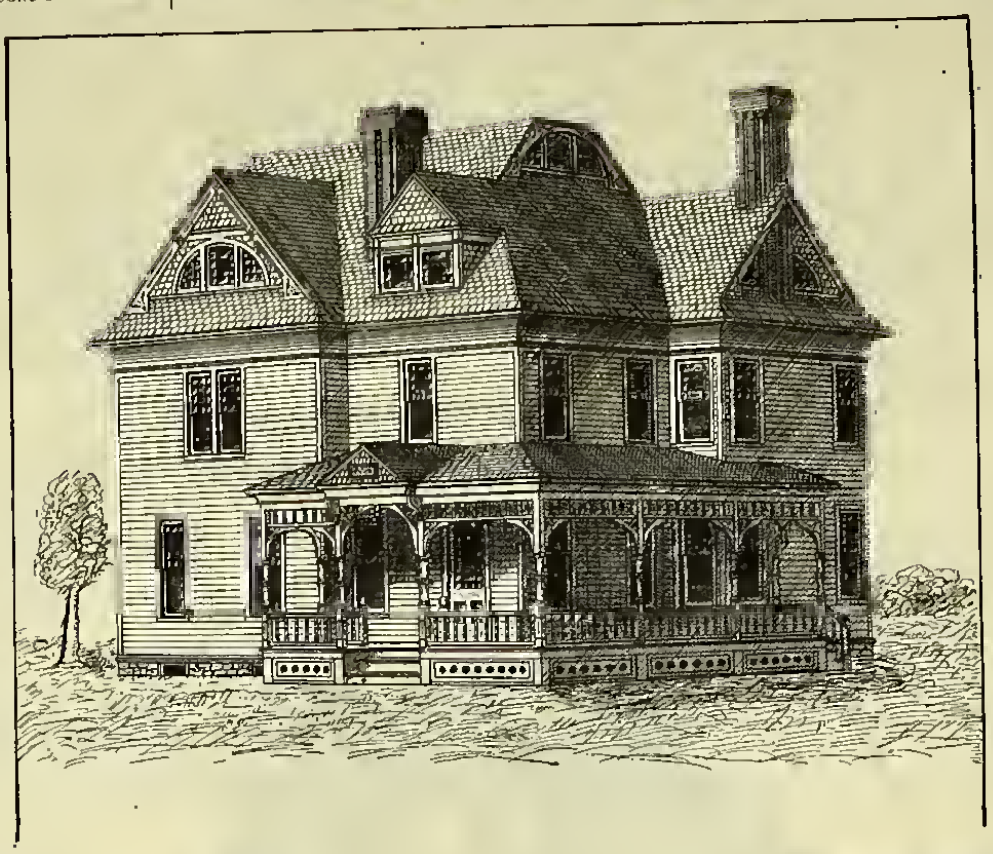
A short time ago there appeared a statement to the effect that the Northern Pacific Railroad would have to snow-shed about forty miles of its line, to protect it during the winter months. This is erroneous. The length of the mountain grades and switchback entire, (the only portion of the line where sheds will be required) is but 20 miles, and only a portion of this will require snow sheds. We are informed by division engineer Huson that the entire amount of snow sheds required on the Cascade division will not exceed eight miles. Statements have also appeared in various papers as to the probability of blockades upon this portion of the road in the future. A comparison with the Central Pacific Railroad may be of interest in this connection. On the latter road, through Blue Canyon and Emigrant Gap, there are 30 miles of continuous snow sheds, and the snow falls to the depth of twenty-four feet. The greatest depth upon the grade of the switchback last winter (which was unusually severe) was less than fifteen feet. With the road in operation, plows running continually to prevent the snow from accumulating upon the track, and the protection afforded by the sheds to be erected, the chances for blockades are slight. When the big tunnel is completed next year, and the seven miles of switchback line are dispensed with, the probability of blockades will be still more remote.—*Ellensburg (Wash. Ter.) Leader.*

FULL plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.

AN OHIO DWELLING.

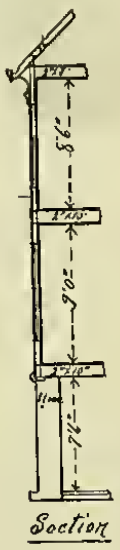
We give the plans, elevations, and perspective view of an eight room house, the estimated cost of which is about $5,000 in this vicinity. W. C. Bartell, architect, Tiffin, Ohio. The estimates include hardwood mantels for library, dining room, and sitting room, and Jackson ventilating grates for each. The plumbing consists of bath tub, water closet, and wash bowl in bath room, and wash-bowl in space between kitchen and hall, and boiler connected to range in kitchen. A sideboard in dining room, hardwood finish on first floor, and pine finish on second floor, and to be first class throughout.



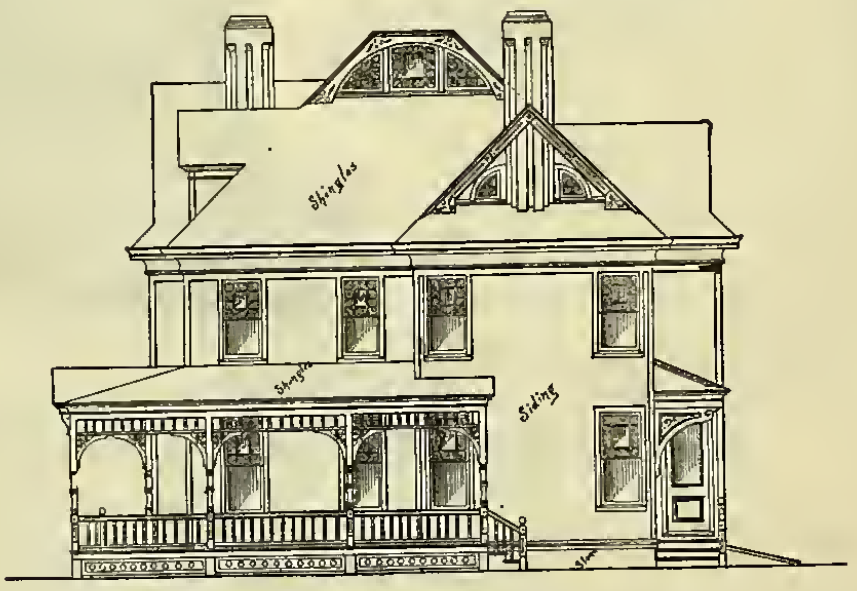
The Corner Finish.

A correspondent of the *American Architect* says: The Buffalo architects have adopted one usage which is not entirely unknown about Boston, though there seems to be a feeling here that it is not practicable. Every one knows how troublesome it is to satisfactorily arrange the corner boards of a clapboarded house. A regular pilaster finish, such as looks so well with a colonial design, is not always desirable or possible, and an ordinary corner board is apt to unpleasantly mark the angles of the house just where the architect would wish to keep them as unobtrusive as possible. In much of the more recent Buffalo work this difficulty is obviated by simply omitting the corner boards entirely. The corner is flashed with zinc against the boarding and the clapboards are run out to the edge and mitered, or cross-lapped like shingles. In either case, the corner is perfectly tight against the weather. There is a house on North Street, just beyond Delaware Avenue, which well illustrates this usage, and is besides so successful in its color that it is worth while to notice it a little in detail. The lower story is in a rather dark red brick. The second story is clapboarded and portions of the gables are shingled, both surfaces being stained a rich, warm brown. The upper portion of the front gable is filled with rough plaster, stuck over with bits of opaque glass, and left a light gray tone. The roof is covered with blue slate. The outside finish is painted a dull Venetian red in the lower story, the architraves, etc., above being a very dark green, the sashes red, and the inside blinds white. The general effect is charming, just enough brightness about the windows to relieve the general sober colors, and with only the difference in texture between clapboards and shingles to mark the two upper stories. Dark tones for house painting seem to be the rule in Buffalo.

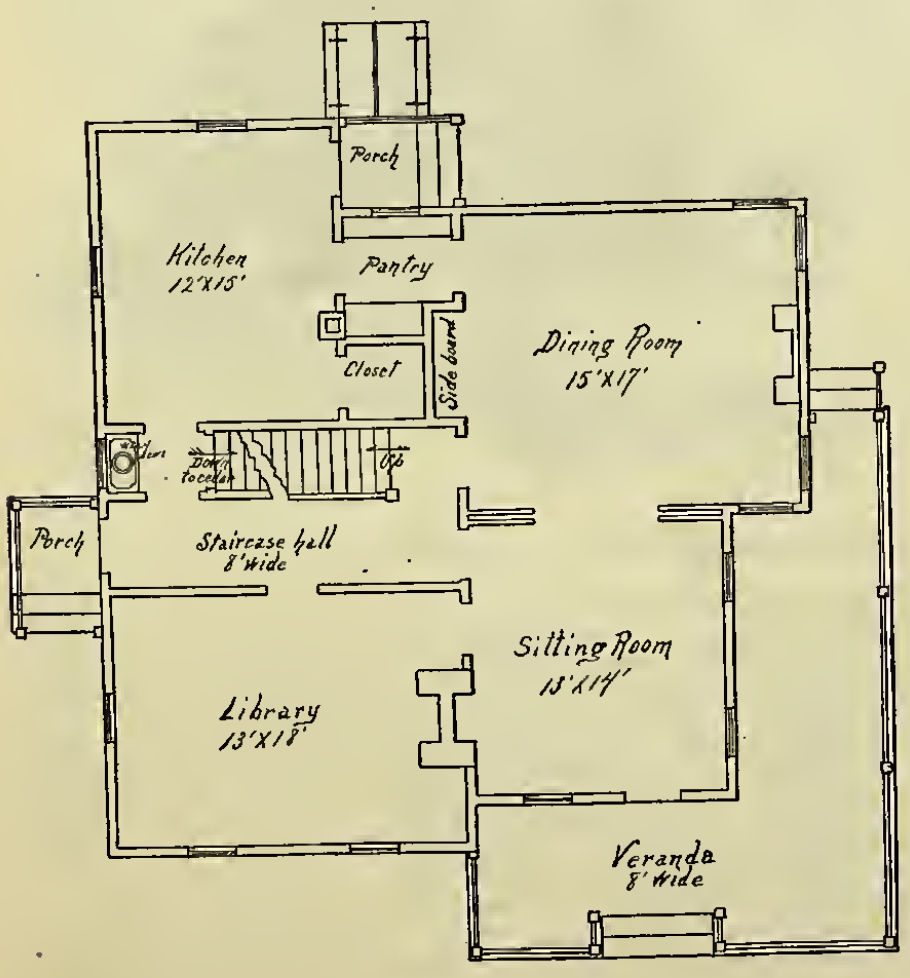
Front Elevation Scale ¼" to the ft.



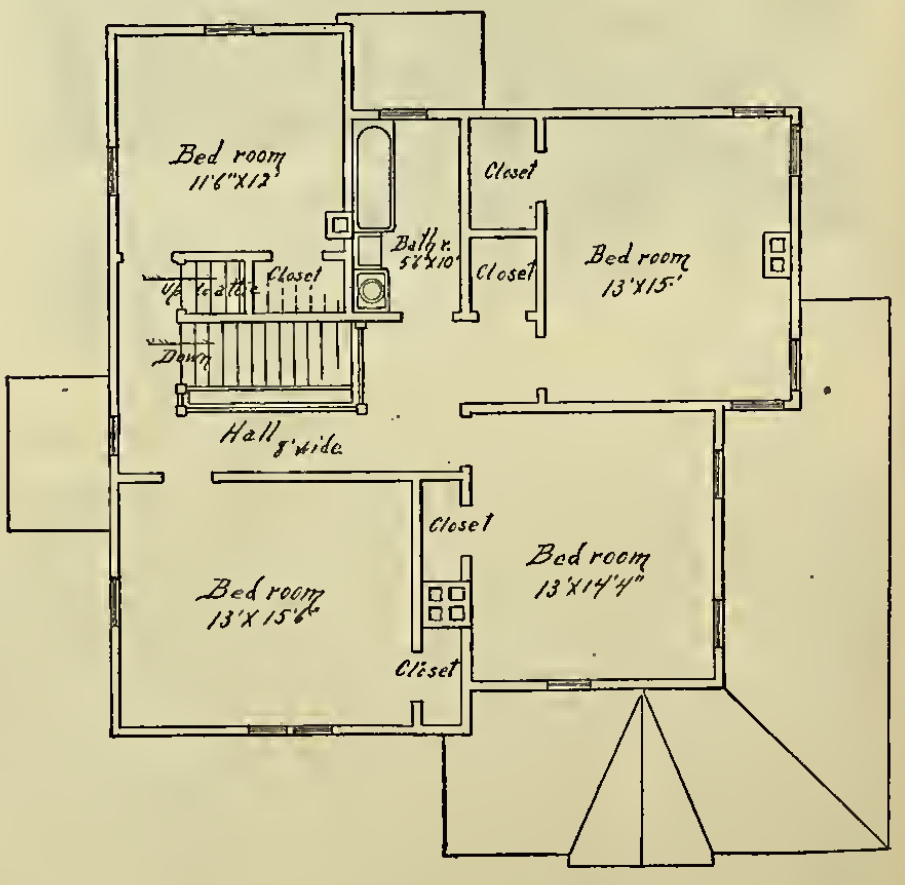
Section



Side Elevation (Right) Scale ¼" to the ft.



First Floor Plan



Second Floor Plan

AN OHIO DWELLING.

Granite.

True granite in its most ordinary form is one of the most easily described and certainly recognized of all rocks. It is a granular, crystalline aggregate of the three minerals feldspar, mica, and quartz. Its name is sometimes said to be derived from its granular structure, but Jameson derives it from "geranites," a term used by Pliny to designate a particular kind of stone. Ordinary granite varies according to the composition of feldspar and mica composiug it, according to the relative proportions of those minerals to each other and to the quartz, and according to the size of the crystals and the state of aggregatiou of the several constituents. The feldspar of granite may he either orthoclase or potash feldspar, frequently flesh colored, but sometiues white; albite or soda feldspar, generally dead white; an intermixture of these two minerals; or, lastly, a feldspar containing both potash and soda, which may he called soda orthoclase or potash albite, as the case may he. Other varieties of feldspar, except, perhaps, in some instances oligoclase, are never found in granite as constituents of the mass. The mica of granite varies greatly in color and luster, being sometimes dark, coppery hrown, passing into black, sometimes green, sometimes golden yellow, and sometimes a pure silvery white. Whether its chemical constitution be equally various is, perhaps, hardly yet sufficiently ascertained. The quartz is commonly colorless or white, but sometimes dark gray or hrown. The proportions of the three constituents vary indefinitely, with this limitation—that the feldspar is always an essential ingredient, and never forms less than a third, rarely less than half, the mass, and generally a still larger proportion. Sometimes the mica, sometimes the quartz, hecomes so minute as to he harely perceptible. The state of aggregation of the mass varies also greatly, some granites being very close and fine grained, others largely and coarsely crystalline. The colors of the rock are generally either red, gray, or white; the first when the feldspar is fresh colored, the latter when it is pure white, the intermediate gray tints depending chiefly on the abundance and color of the uica, but sometimes on that of the quartz. Large and distinct crystals of feldspar sometimes occur disseminated at intervals through the mass, giving the rock a porphyritic texture. It is then called porphyritic granite. Other minerals besides the three mentioned above sometimes occur in granite. Among these are hornhlende, actinolite, tourmaline, schorlchlorite, and steatite. When hornhlende is ahundant in rock, and the mica becomes scarce or altogether disappears, it becomes a syenite.—*J. B. Jukes.*

DESIGN FOR A BANK BUILDING.

We give the front elevation of the new Third National Bank building at Knoxville, Tenn., built for Mr. Frank McNulty, Baumann Brothers, architects.

The building is constructed of Tennessee marble, has an open timher roof, plate and art stained glass in front, tile floor; interior finish is of oak, fitted with latest improved bank fixtures.

The cost was ten thousand dollars. It is a very attractive and elegant design.

Brick Dust Cement.

According to a statement of Mr. Miles, a well-known engineer, it is a fact peculiar to Spanish countries that ordinary brick dust, made from hard hurned, finely pulverized bricks, and mixed with common lime and sand, is universally and successfully employed as a substitute for hydraulic cement. Mr. Miles says that during an engineering experience of some six years in Cuba, his opportunities were ample for testing its merits, and he found it in all respects superior to the best Rosendale hydraulic cement for culverts, drains, tanks, or cisterns, and even for roofs. In an experiment to test the strength of this produet, it was found that a block of it, one-half inch in thickness, without sand, and after an immersion in water for four months, bore, without crushing, crumbling, or splitting, a pressure of fifteen pounds per square inch. It is thought that, by the addition of pulverizing mills to brick yards, to utilize the waste and broken bricks, a profitahle manufacture might be carried on.

A BELL, for which the elaim is advanced that it is the largest in the world, has just been christened at Berlin by the Archbishop of Cologne, in the presence of the civil and military authorities of the district. It is hung in the cathedral, and is called the "Emperor Bell." It received the name of "Gloriosa" at the christening.

THE PIETSCH HOUSE TRAP.

We illustrate herewith several views of the sewer gas trap devised hy Mr. Herman Pietsch, of 360 Fulton Street, Brooklyn, N. Y., which has lately attracted considerahle attentiou on account of the favorahle report upon it made hy the Brooklyn health hoard. The

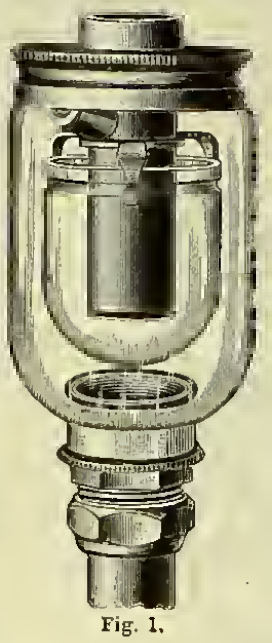


Fig. 1.

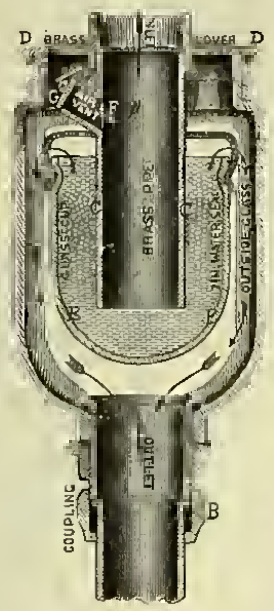


Fig. 2.

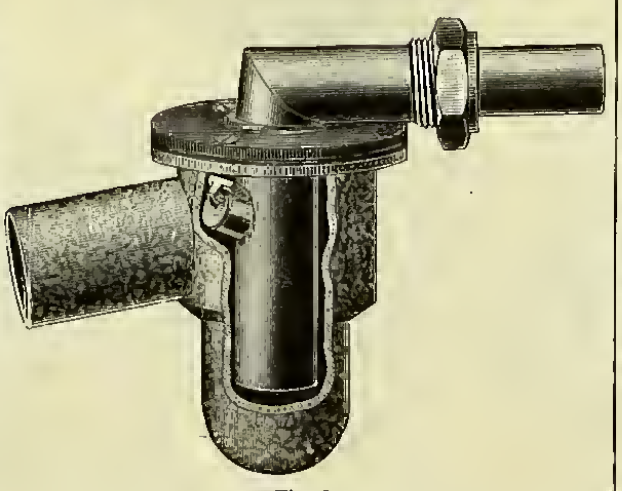


Fig. 3.

device has been known and nsed for several years, and has nade a good record for itself in respect to the special claims made for it by the inventor on the score of cleanliness, effectiveness of its sealing quality, and its positive protection against siphoning, which last named is one of the most serious ohstacles to the effective operation of sewer traps in general.

Of the cuts, Fig. 1 represents an exterior view and Fig. 2 a vertical section of the trap. It is nsually constructed of glass (save the metal cover), so that its condition may he inspected from time to time without the necessity of removing it for that purpose. It is specially designed by the inventor for use in connection with wash hasins, bath tubs, kitchen and pantry sinks.

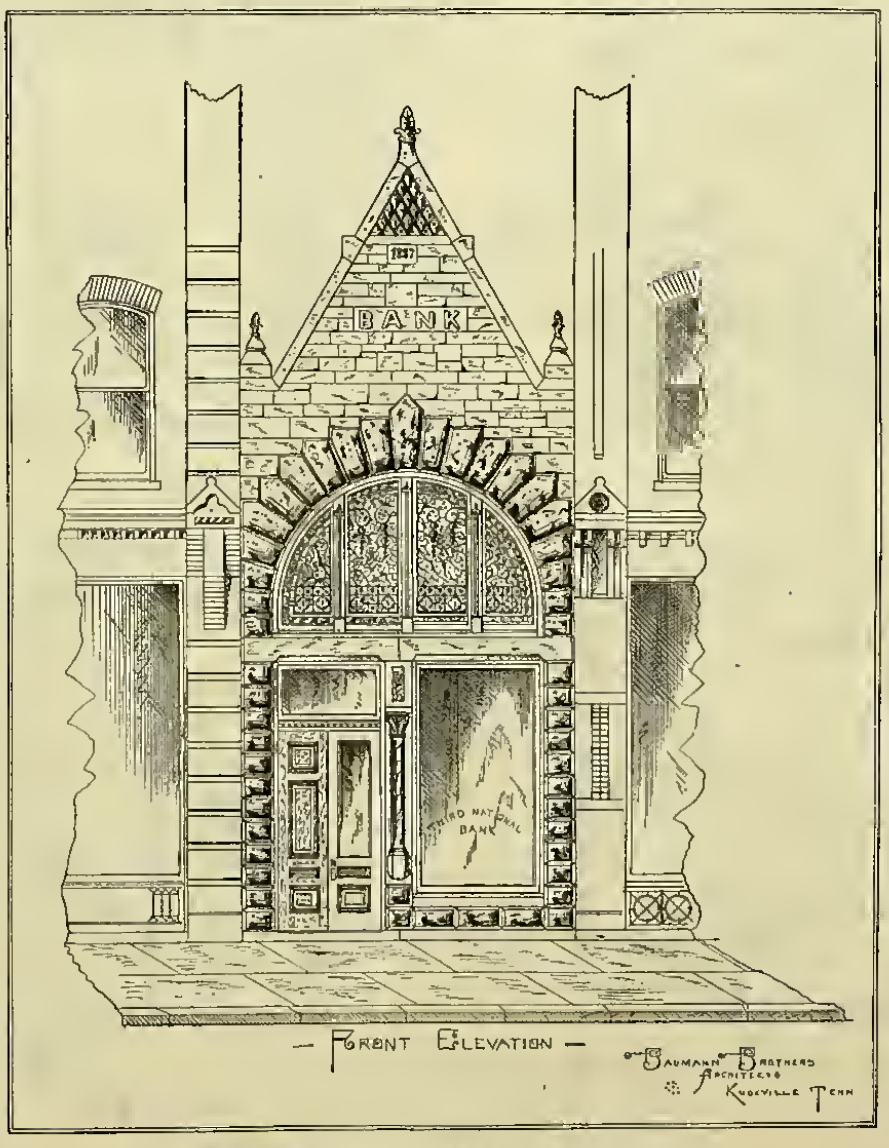
Referring to Fig. 2, the trap will be seen to consist of an outer vessel of cyliudrical form, provided above with a brass or metal cap, through the center of which the inlet pipe passes. This inlet pipe is provided with a female screw coupling to screw directly upon the outlet pipes of the wash basin, etc., and provided below with a neck, to which, with the aid of a proper coupling, the outlet pipe leading to the sewer is attached. Inside of the outer cylindrical cup is a smaller one, suspended within it hy means of metal clamps, and into which, almost reaching its hottom, the inlet pipe from the fixture to which it is attached is made to project. From the side of this inlet pipe a small tuhe projects, just above the inner howl. This is provided with a gate or cover, held in place hy a douhle hinge, operating automatically.

The operation of the device is substantially as follows: The waste water enters the trap through the inlet pipe, discharging itself into the inner cup, overflowing from this into the annular space between the outer and inner vessels, and then passing off through the outlet pipe to the house drain. The course of the waste water is indicated by arrows in the sectional cut, Fig. 2. The shape of the apparatus is such that siphonage will be rendered difficult; but to guard against the possibility of such an accident, the valve in the inlet pipe, before referred to, is provided. So soon as any notable difference of pressure is manifest from the sudden injection of water into another trap on the same line, the hinged cover opens, and air enters, producing an immediate equilibrium of pressure.

Fig. 3 represents a form of the apparatus made of metal, and intended more partieularly for use in connection with bath and wash tubs. The body of this variety of trap is of tinned malleable iron, and the arm on top is of brass, working on a swivel, with a lock nut under the cover, wherehy the trap can he placed at any desired angle.

The maker presents a large array of claims to excellenee for this device, from which we cull the more important: The closeness of the trap to the utensil; the readiness with which it may be removed from the utensil by uncoupling; its cleanliness, derived from its scouring qualities; the small amount of water needed for cleansing; the impossihility of any sewer pressure to force any gas through the water seal, and, as a corollary to this, the impossibility of the loss of the seal by siphonage or evaporation.

The Pietsch trap, as above noted, has been tested lately hy the Brooklyn health authorities, who made a very flattering report upon its merits, and, as a consequence, it is now entered on the list of traps which are permitted to he introduced in plumhing work in that city. The judges of the American Institute exhihition likewise awarded it the medal of superiority in the class to which it helongs, for the years 1883, 1884, 1885, and 1886.



DESIGN FOR A BANK BUILDING.

Excavating in Frozen Ground.

It is often necessary to make excavations for pipes in very cold weather, under which conditions the operation is difficult. The tronble due to frost can only he remedied by thawing out the surface.

The *Elettricita* says that quicklime has been tried with success. The surface where the excavation is to hegin is covered with alternate layers of lime and snow. The lime becomes slaked, and heats the soil so effectually that after ten or fifteen hours it can he dug up with the greatest ease, even where the cold is excessive. Where there is no snow, water can be used.

THE Master Builders' Assoeiation of Boston have bought the edifice Nos. 164 to 170 Devonshire Street, in which their rooms are located, paying for the same the amount of $250,000. The building is a four story granite structure. The association proposes to add two or three stories more to its height as soon as the leases now existing expire, and then make it a first-class office building, with opportunity of enlarged accommodations for themselves. The property adjoins the Equitahle Life Insurance Company's building, and runs through from Devonshire to Federal Streets, covering 6,662 feet.

Caen Stone.

The general character given of the Caen stone is that all the beds are of the same quality, and all equally adapted for building purposes; but evidently, from the information which I collected on the spot, and subsequently in London, there are modifications in each bed, as may be reasonably supposed, and as experience teaches us in the quarries of other oolitic stones in Bath and Portland. Various veins traverse the beds in all directions, and have a white appearance. This white substance is equally hard with the stone itself, and if a stone be laid with its bed parallel with the direction of these veins, it is of little consequence, but they, of course, indicate a certain unsoundness or division in that part; and if the stone be laid with this vein in a vertical direction, the block will run the chance of being fractured by a weight, or, if near the surface, it probably may admit the wet. These veins are not like those in the Bath stones, which are hard, consisting of crystallized carbonate of lime, and running always in a vertical or inclined direction, and not liable to separation. In general, it is considered that the blocks of Caen stone may be placed in construction in any direction, except when the white veins are perceptible. It is said that the most experienced eye can hardly detect the different qualities of the stone in the block when once they have been removed from the quarry, as the action of the quarryman's tool on the surface hardly offers any indication, and there is no appreciable difference in the appearance of the granular formatiou.—*T. L. Donaldson.*

A COTTAGE AT CAMBRIDGE, MASS.

This cottage is to be erected in Cambridge, Mass., for C. B. Moller, Esq. The designs, whicb are by Mr. C. H. McClarc, architect, Cambridge, Mass., represent a house of modern design, conveniently arranged, which it is estimated can be built for four thousand five hundred dollars.

The vestibule is roomy and convenient, and is an advantage to any house, making it warm in winter and cool in summer. The hall is large, with an alcove window, and is used for a reception room, and is connected witb parlor by double sliding doors, and with dining room and kitchen by swing doors.

The parlor and dining room are connected by sliding doors, and each has wood mantels and hard-coal grates. The kitchen is large and convenient, with entrance to dining roou through pantry. The second floor is reached by stairs from the hall, and contains four chambers with large closets to each, and large bath room, which is directly over the sink in the kitchen, whicb keeps the water confined to one corner of the house, thereby saving expense in plumbing. The attic contains two large bedrooms and large closets, and is well lighted.

The foundation is of rough stone, twenty inches thick to grade line and eight inch brick to sill.

The frame is of spruce, sheathed with hemlock boards, overlaid with resin sized paper. The outside finish is of white pine, with spruce siding to belt cornice, and plain shingles above, with cut shingles in front gable. The roofs covered with good sawn shingles stained before laying.

The inside finish on first floor (except kitchen) to be of whitewood, cherry-stained and varnished. The kitchen and chambers to be of pine, painted in lead and oil.

Floors in kitcheu and bath roou of tbree inch hard pine (rift grain), all other rooms good quality spruce three to four inch wide.

Outside painting to be as follows: Roof, ereosote; front gable, dark yellow; shingles above belt course, raw sienna; siding, dark gray; all exterior cornices and trimmings, dark olive green.

To Obtain One's Bearings with a Watch.

A correspondent of *La Nature* points out the following simple method of obtaining one's bearings with a watch. Turn your back to the sun, then take out your watch and place the small hand in the direction of the shadow made by your body. Then imagine a line starting from the center of the dial of the watch and passing through midday. The bisectrix of the angle formed by this line and the small hand gives the north.

LOVE-LIES-BLEEDING.

(AMARANTHUS CAUDATUS GIBBOSUS.)

There are few annuals that give a better return for judicious care and attention than the many members of this highly ornamental genus, and more especially the forms of the kind represented in the accompanying illustration. We rarely see the amaranthuses developed as they should be, and this, we believe, is not so much the fault of the soil or the season as of the grower, who treats these choice annuals the same as others of a hardier nature. A. caudatus and the variety Gibbosus

speciosus, and a few others, if properly treated and allowed to fully develop their stems, are capable of forming pyramids five or six feet in height, hung round with the long, graceful, tail-like racemes of bright-colored stems, flowers, etc. It is waste of time to plant them so many inches apart, as the plants will not have room to develop in such close quarters. When grown in vases or isolated in light, rich soil, the peculiar character of these plants is brought out in a very striking way. They may also be used with good effect in sub-tropical beds, in company with castor oil plants, solanums, wigandias, etc.—*K., the Garden.*

Messrs. Munn & Co., Scientific American office, 361 Broadway, N. Y., are assisted by able architects in the preparation of plans and specifications for all descriptions of buildings. Terms very moderate. We aim to make our estimates accurate and our plans complete, so that when placed in the builder's hands no difficulty is experienced in the construction. Our work goes to all parts of the country, and gives very general satisfaction. We shall be pleased to hear from those who contemplate building.

Wood Carpet.

The manufacture of wood carpet is a developing industry in Cbicago. There are but four wood carpet factories in the United States—one in Philadelphia, two in Chicago, and one in Racine, Wis. For several years after parquetry flooring was introduced into the United States, John W. Boughton, of Pbiladelphia, and L. Benedict, of Chicago, divided tbe wood carpet business of tbe entire country between them. Mr. Benedict now has a carpet factory in connection with his basket works at 40 Green Street, between Erie and Chicago Aveuue, Chicago. He uses oak, maple and ash largely, though the finer woods, such as walnut, cherry, mahogany, rosewood and ebony, are worked into the finer makes. Of oak alone about 200,000 feet a year is consumed. Asb and maple are next in amount of consumption.

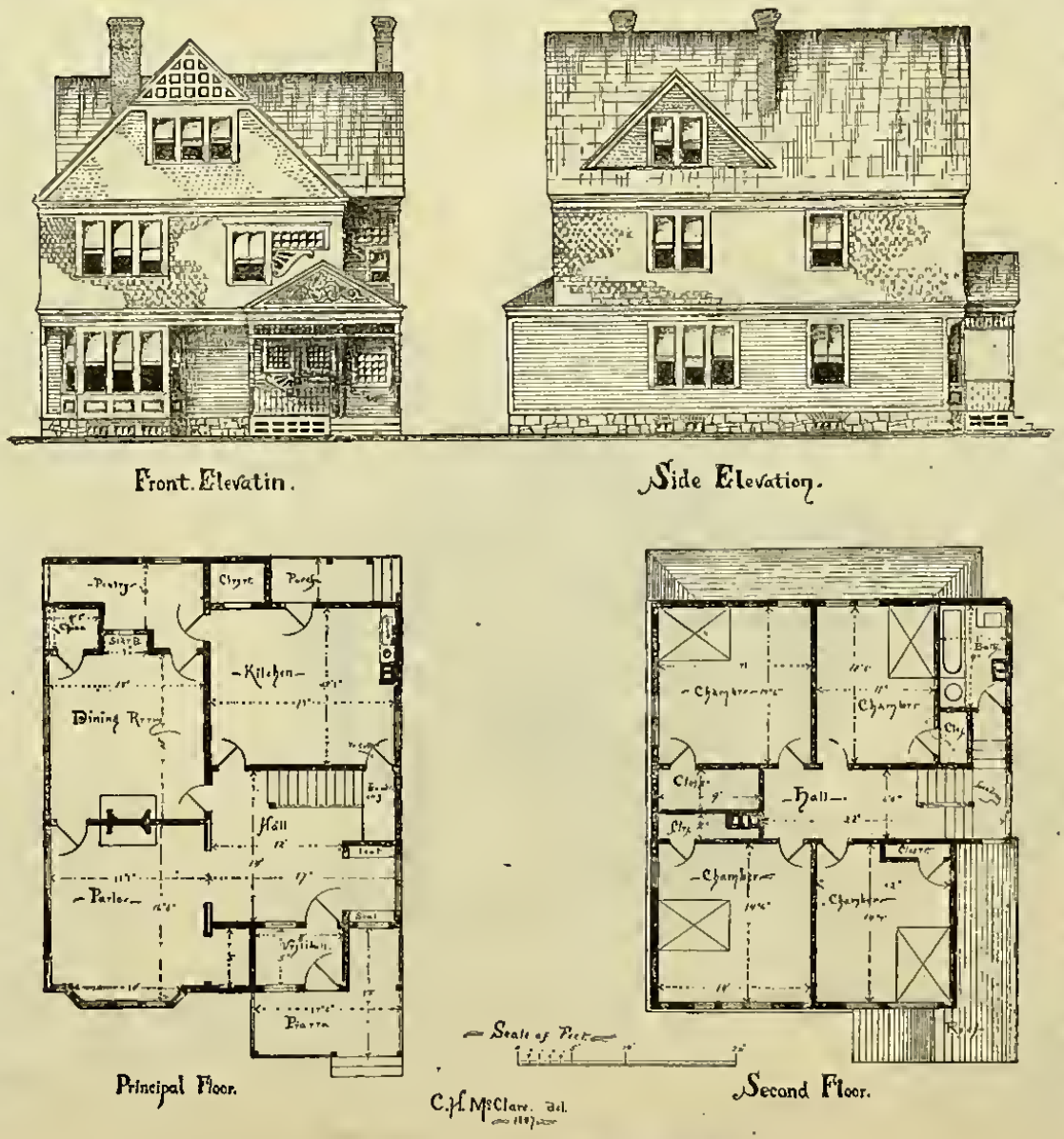
The use of wood carpet is constantly on the increase, and there is scarcely any limit to tbe prospects for it. This kind of floor covering can be made so as to sell as cheaply as a good quality of ingrain, or it can be so wrought witb costly woods as to sell at $1 or more a foot. Good oak, ash, and maple carpet can be sold at between eighty and ninety cents a yard. Finisbed in oil, it is good enough for any ordinary use. For wainscoting and ceiling it is admirably adapted.

The process of making wood carpet is comparatively simple, though the work must he done with exactitude. Carefully adjusted saws strip the lumber into the desired thickness and width, the latter differing according to tbe work required. The stuff is then subjected to the saws that cut it out in proper shape for inlaying, to form the fabric and figure of the carpet. Tbis must be done with much particularity, as each of the multiform pieces must exactly fit. The arrangement of the pieces and the gluing of tbem is done by lads, and looks like slow work, but yards are thus woven with fair celerity. Canvas is glued on one side to give strength to the fabric. The carpet is then subjected to sand paper, and is finally finished with hard oil. The designing of wood carpet is tedious and expensive. Sometimes the manufacturer devises and works out a pattern at great expense, only to find that it does not suit the popular taste, and must be thrown aside. The popularity of woods also fluctuates, as it does in interior finish. Plain white oak carpet is now very salable, because it is cheap, finishes well, and is of lasting quality.—*N. W. Lumberman.*

The Chimney Top.

A long experience in burning wood fuel in both heating and cooking stoves has brought out a danger point in its combustion that may throw light on some of the unexplained fires that from time to time occur in both city and country, and especially in the country. Being much annoyed by rain running down inside the flue, writes "Observer" in the St. Louis *Miller*, I procured a sheet iron cap for one flue and a fire clay T cap for the other. After that time I was every now and then troubled with the flues being on fire, and in several instances the roof took fire outside. After a long experience of this kind the iron cap was removed, and no fires have been in that flue or on the roof of that building.

This led to a close watch over the other building, which had the stove pipe enter into a fire clay pipe flue of six feet, ending in a T top on the outside. The fire clay flue rises through an attic. The frequency of fires led to a very careful examination into all the associated conditions. Thus I find that the colder the weather is, there is not only increased combustion, but increased condensation of the elements of the wood carried up in tbe smoke, and, striking against the top cap, is retarded in its emission, and water and a tarry substance containing an inflammable oil is thrown back down tbe flue, and gathers on tbe top and around the openings of the top, often dropping on the roof. This substance is easily ignited, and the flue, the top, and the matter on the roof all burn with great force, and is a source of great and constant danger. I have tried burning zinc, sulphur, salts, etc., but all fail. Direct draught, no obstruction by caps, and frequent cleanings are tbe only preventives of the danger. The soot, of itself, has little or no inflammability.—*Fireman's Herald.*



A COTTAGE AT CAMBRIDGE, MASS.

AN AMERICAN COTTAGE IN LONDON.

Among the notable attractions of the American Exhibition now open in London is a shingled cottage, of which we give a drawing from the London *Building News*.

Those of our readers who remember the various examples of English country dwellings we have published will readily understand how very novel and peculiar the American cottage must appear to the British eye. But it is satisfactory to know that our English cousins seem to approve the building, and its erection in London is likely to have beneficial results

The cottage shown can be built here for about $4,500.

Industries and Handicrafts in Central Africa.

Handicrafts and domestic industries are neither numerous nor noteworthy in this part of the globe, yet a few deserve mention.

The upper Nile boats are curious specimens of naval architecture. They have no ribs, but the planks are laid one on another, and large nails are driven diagonally from both sides. They are calked with rags from the inside, and the seams are not payed with pitch; hence many leaks occur through rats pulling out the rags.

The only agricultural implement in the Bari country is a sort of shoe, shaped exactly like the ace of spades, fixed to a handle about 9 ft. long; this is pushed before the culturist as he walks, cutting the roots of the grass, and just scuffling the surface of the ground. The Fatiko hoe is similar to that used in the Bari country, but instead of being mounted in the same way, it is fixed to a short handle in such a manner that the hoe is nearly at right angles with the handle. This makes a very powerful instrument, digging into the soil for considerable depth.

In the Cazembe's country the people play on a kind of rude piano, call *marimba*.

Throughout Usmao the baobab (*Adansonia digitata*) flourishes remarkably. From its bark the people make very strong, pliable rope. In Ugara some of the streams are spanned by grass bridges, called *usisa*.

Palm oil is largely prepared in Uguha; and in localities producing ebina clay there are large pottery works. Rua and Manyuema turn out artistic ironwork and the famous grass or palm fiber cloth. Cotton cloth is also made at several places, and various woods and barks are utilized for particular purposes—one kind for canoes, another for spear shafts, a third for mortars, a fourth for pestles. Matting and baskets of many kinds, wooden bowls, dishes, and drums, are largely manufactured. There are also blacksmiths and coppersmiths, but most of their metal wares are procured from the Warua. They have a species of cymbal imported from this tribe, made of iron, in the shape of the letter U, and sounded by a piece of stick with a head of India-rubber.

The weapons of the Masai are spears (*omberi*), shields (*elongo*), swords (*ollulem*), clubs (*ologuma*), bows and arrows (*oluiandai, orseiyet, ombaia*), and knives (*ossirere*). They cut their own clubs from the roots of hard trees. The shield is made of ox skin, of oval shape, about 4 ft. 6 in. long, and 2 ft. wide in the middle. The hoes are made of "ebony." Formerly their spears and swords were made of hard wood, but now they import metal heads from their neighbors, to whom they are also indebted for the small metallic ornaments worn by the women, having no iron in their country, and no knowledge of working it. Their spear blades are 18 in. long and 5 in. or 6 in. wide.

In Mambwe's country, on Lake Tanganyika, much iron ore is smelted. The kilns are larger than those used by the Ajawa and Manganja. They stand about 9 ft. high, and are ft in diameter at the base and 3 ft. at the top, and are built of clay plaster 4 in. to 6 in. thick They will contain nearly half a ton of iron ore. Charcoal is used for smelting.

The Waluuga are not behind other lake tribes in their industries. Excellent pottery, as well as baskets, is made in the country, and their millstones are built into a sort of solid table in one piece, with a pit or receptacle for the meal. Cotton cloth, too, is made in almost every village.

In Kairrondo the spears are long, and have short blades. The shields are made of buffalo hide, and are about 5 ft. high and 3 ft. wide. Neither swords nor knives are in use. The natives navigate the lake (Victoria Nyanza), their boats being made of planks sewn or pegged together, and sometimes provided with a sail made of *basuti*, a colored stuff imported from the coast.

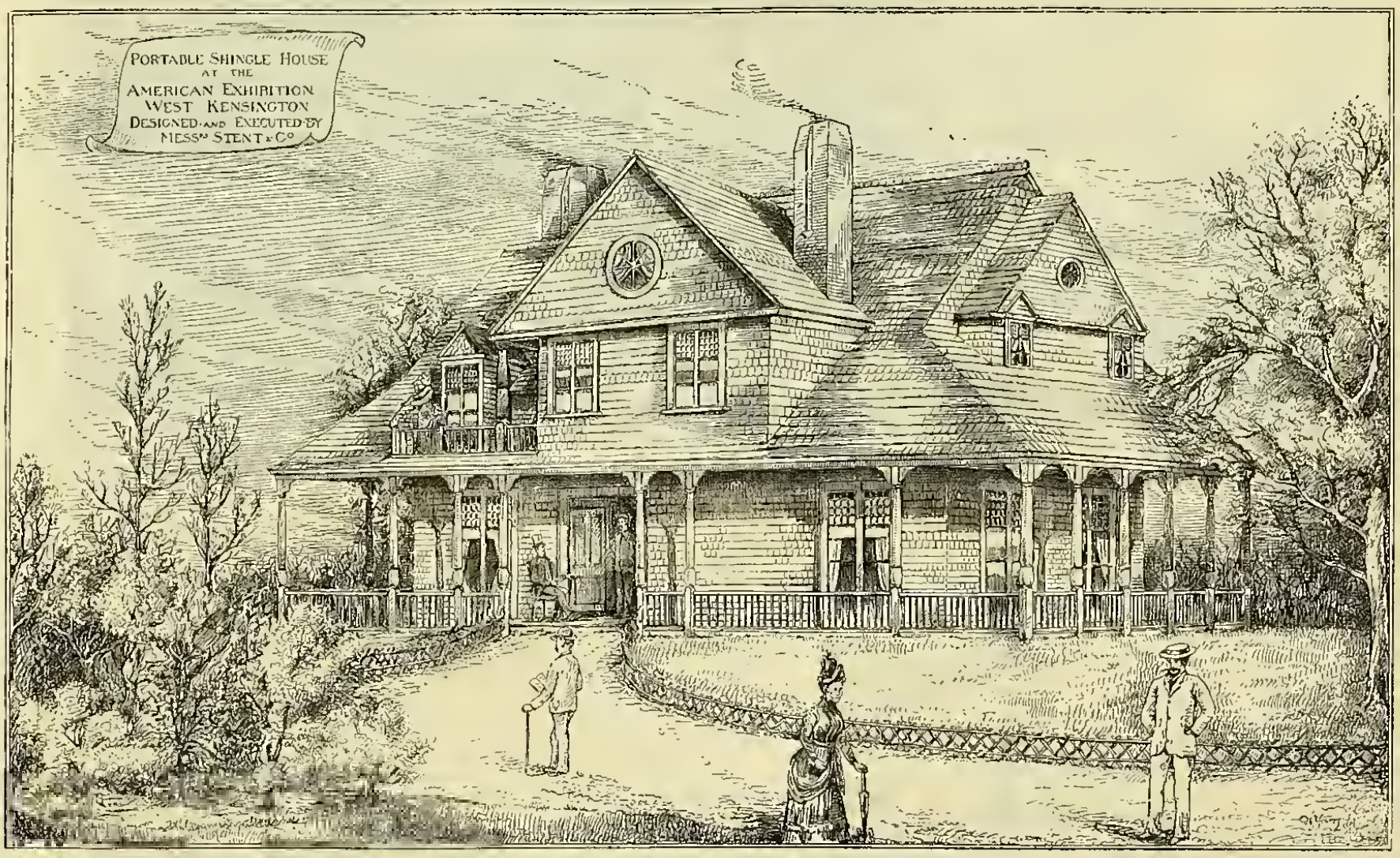
There are blacksmiths in Ukara who manufacture hoes, axes, and spears. Cooking pots of clay and wickerwork baskets are likewise produced.

The Waganda are celebrated for their basket-work. Baskets are even used as vessels to drink from, one great shallow basket being the family drinking cup. From the inner tissue of banana stems they make napkins and pocket handkerchiefs.

The granaries of some tribes on Lake Tanganyika deserve notice. They are built on posts, with floors raised about 3 ft. from the ground, 4 ft. to 12 ft. in diameter, and the largest 20 ft. high, without including the roof Those for old corn are plastered over, and have a small hole under the eaves for access, which is reached by a notched trunk used as a ladder. Those for fresh corn are made of 11 ft. canes about 2 in. apart, with hoops of the same material every 2 ft. or 3 ft., thus allowing the air to pass through freely.

The fictile arts in the neighborhood of Tanganyika have reached a high stage of development. The process adopted is as follows: First, rough clay and water for one pot are beaten with a pestle like that used for corn, till they form a perfectly homogeneous mass. This is put on a flat stone, or in the bottom of another pot, and hollowed in the center by a slap of the hand. The workman (or rather woman) then shapes the vessel roughly by the hands kept constantly wet, smooths out the finger marks with a corn cob, polishes it all over with bits of gourd and flat wood, and ornaments it with a sharp pointed stick. After drying for four or five hours in a shady place, it is stiff enough to receive the bottom, which is worked in from another piece of clay. A pot capable of holding two and a half to three gallons occupies about forty-five minutes in manufacture. The shapes are very graceful and true, reminding one of the Pompeian amphora. The vessels are used for holding palm oil.

On the road between Dar es Salaam and the Nyassa country rubber vines abound, and, apparently, are but little affected, except in the immediate neighborhood of the villages, by the reckless mode of tapping employed. In many parts a native can still gather three pounds of rubber daily. Another staple of the district is copal, which is found in many parts. It seems that this fossil resin exists, even in the richest diggings, only in patches, as though it had been produced by isolated trees. The natives appear nowhere to work the country systematically, but to sink test holes, and, on finding traces of the resin in any part, to work that thoroughly. The resin now found underground, usually in red, sandy soil, is undoubtedly the produce of the same species of tree as still exists in these jungles, which now yields an inferior sort of resin; the difference between the two being the consequence of age and a chemical or molecular change effected by time. The copal tree grows throughout the Uzamaro country, and is by no means confined to the sea coast, but is even more abundant inland, beyond the first coast ridge, not, however, after the limestone formations appear.



THE YANKEE COTTAGE NOW AT THE AMERICAN EXHIBITION, LONDON.

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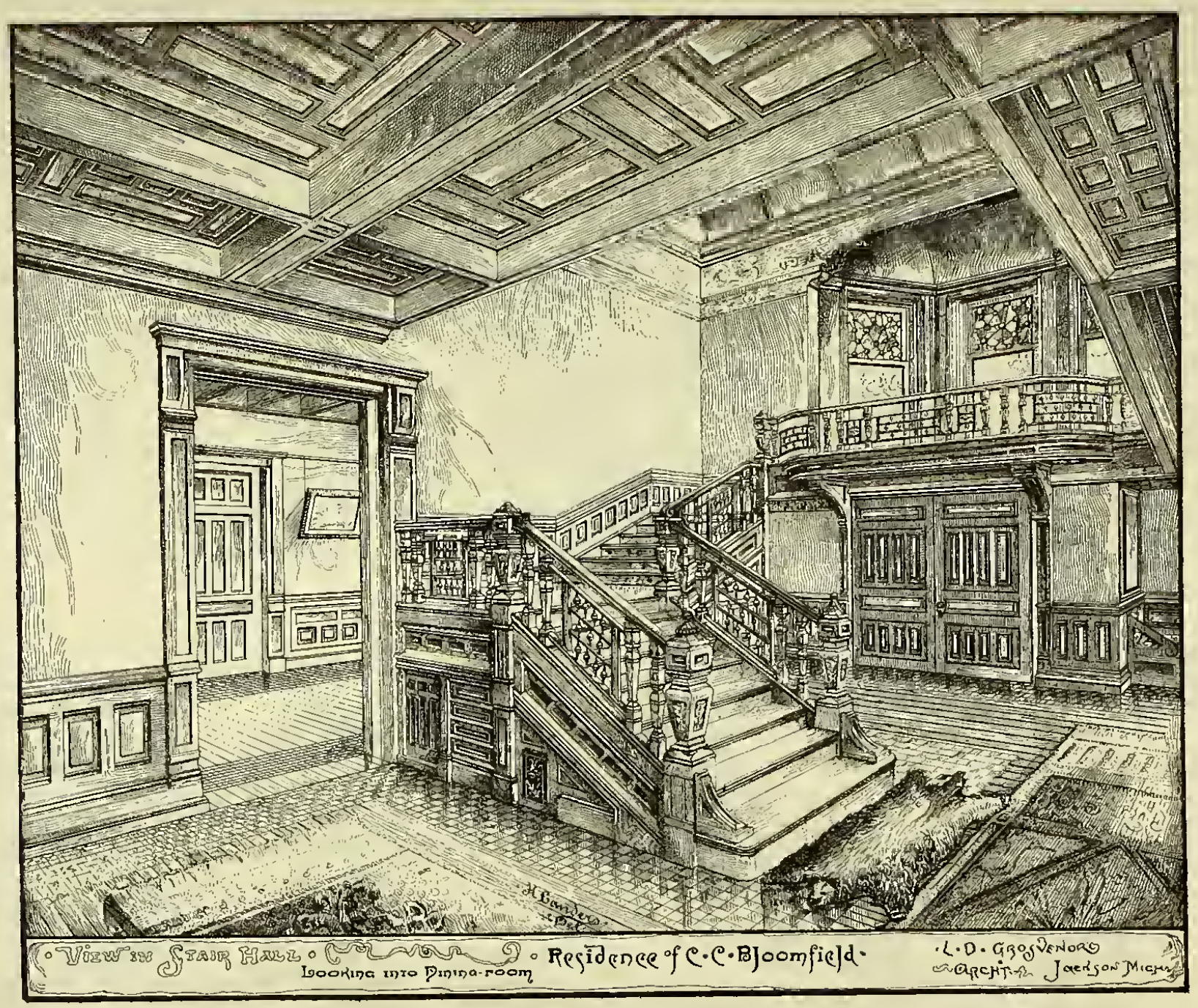
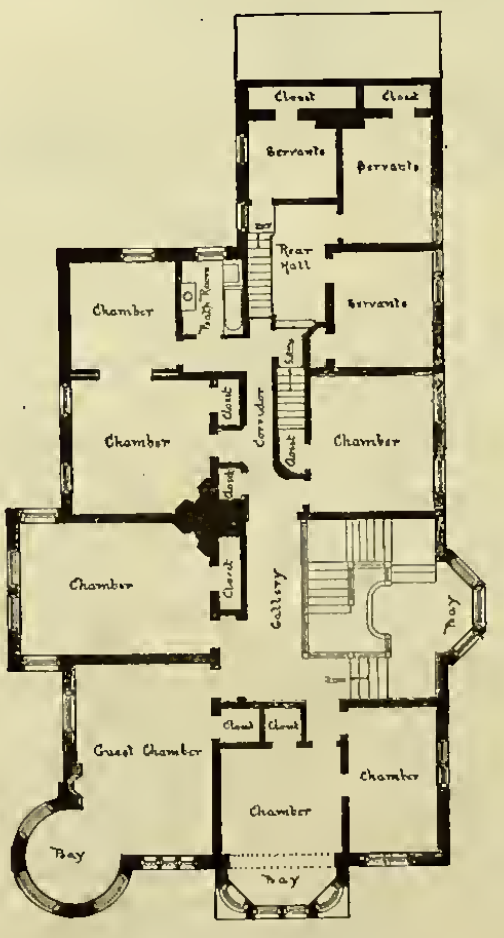


First Floor Plan

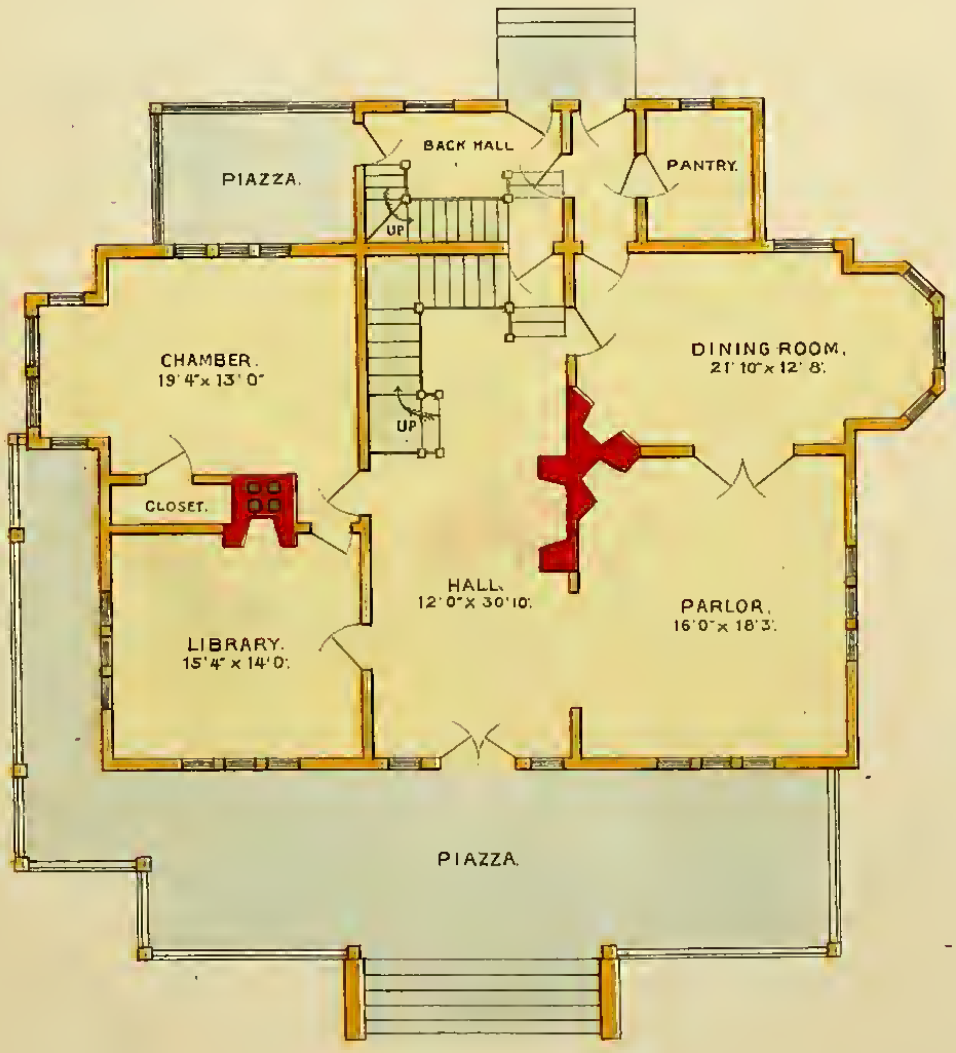
L. D. Grosvenor Archt
Jackson Mich.



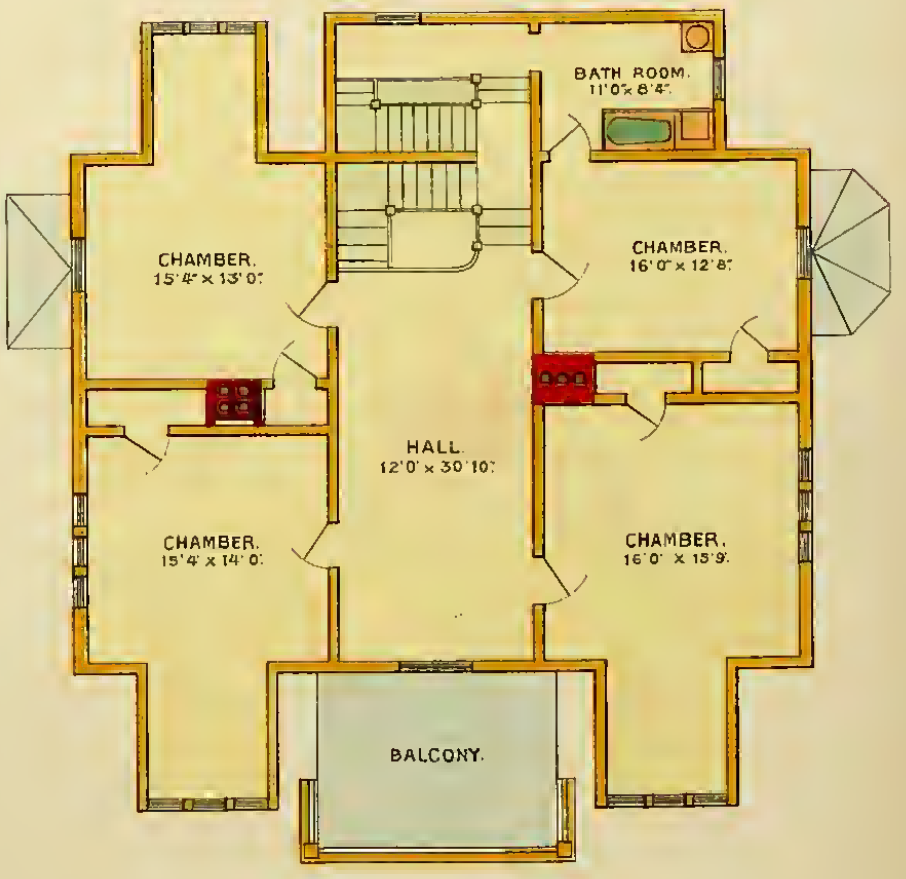
Second Floor Plan

RESIDENCE OF C. C. BLOOMFIELD, ESQ., JACKSON, MICH.

A Southern Residence of Moderate Cost.



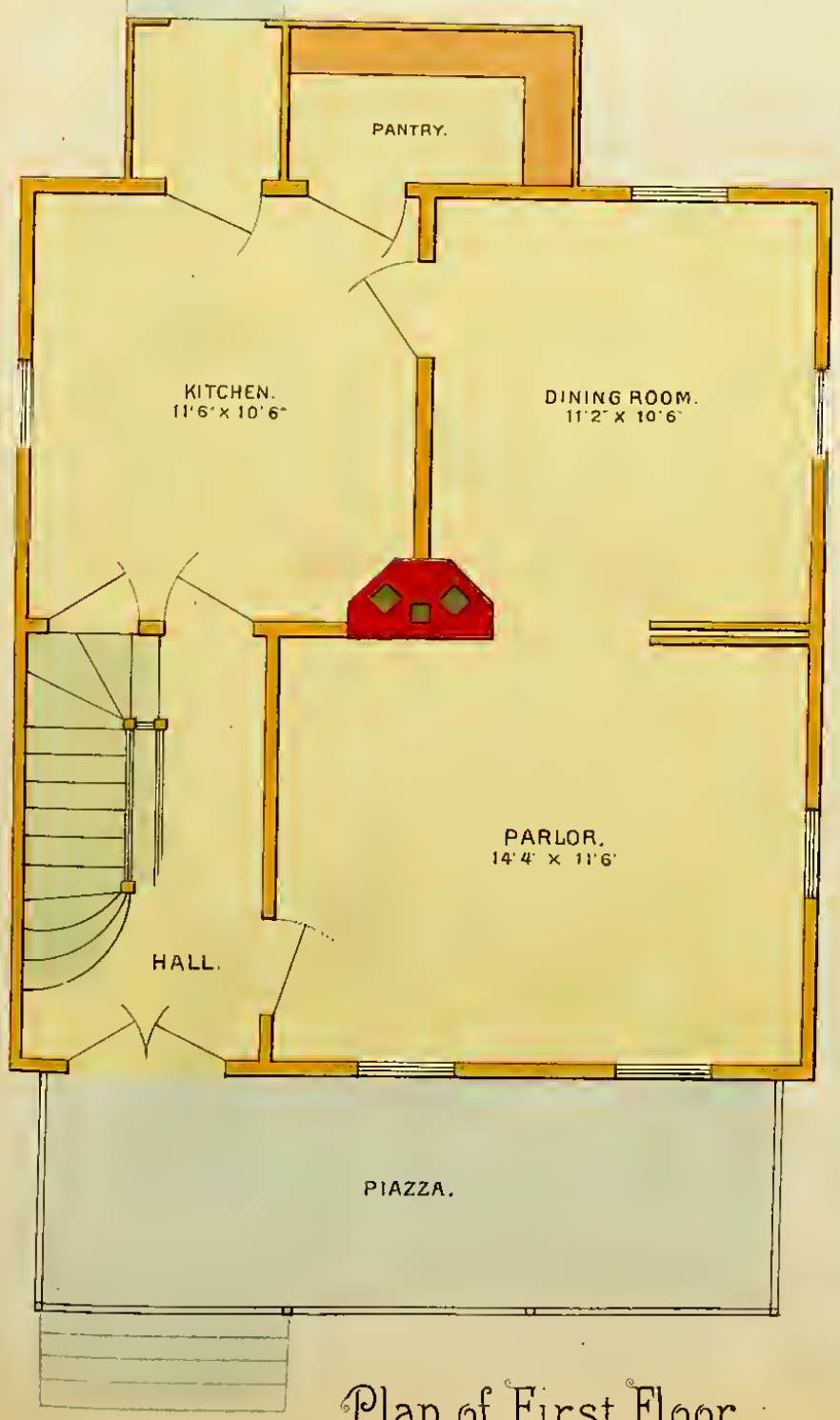
Plan of First Floor.



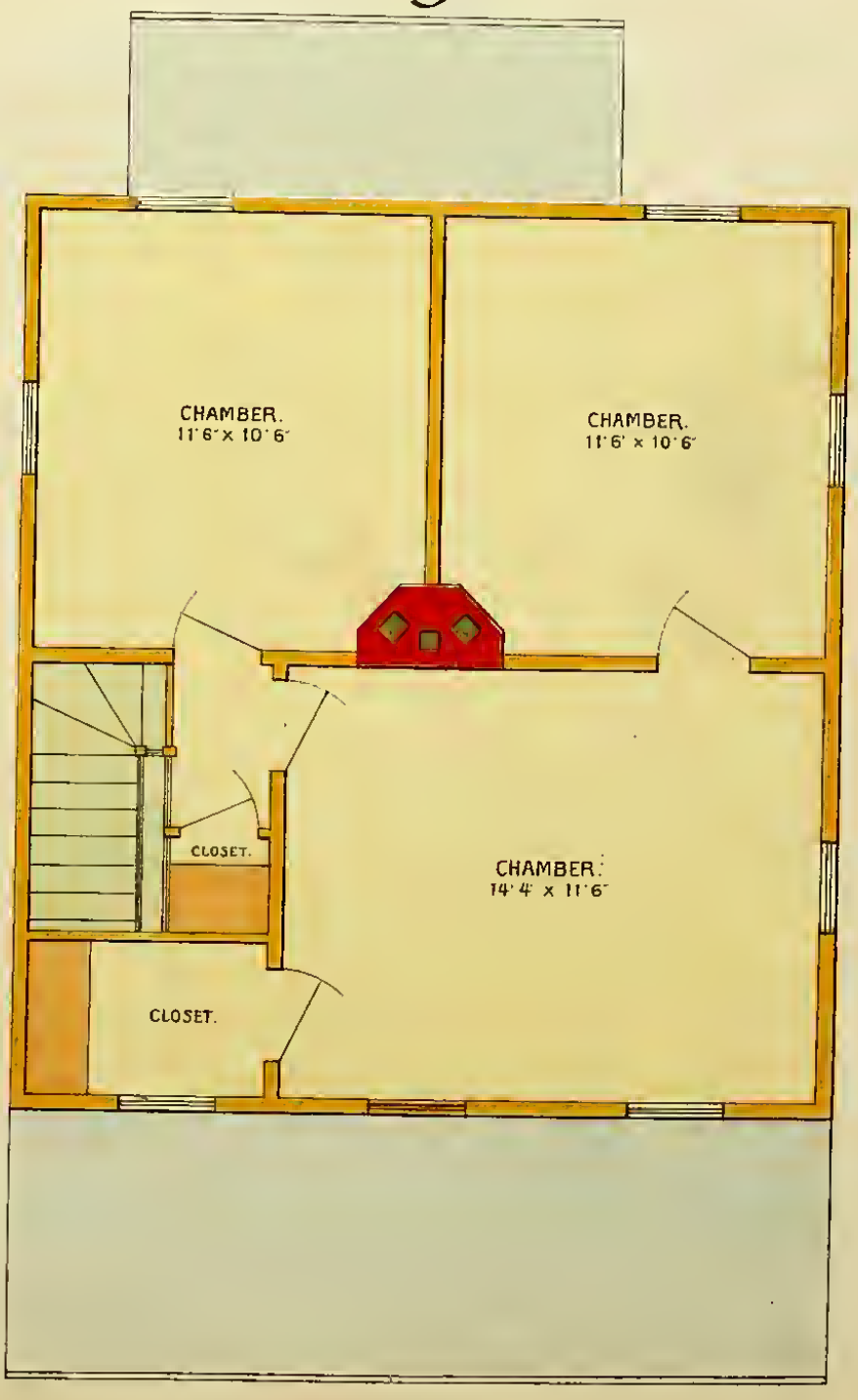
Plan of Second Floor.

MUNN & CO. ARCHITECTS. SCIENTIFIC AMERICAN. PLAN NO. 81

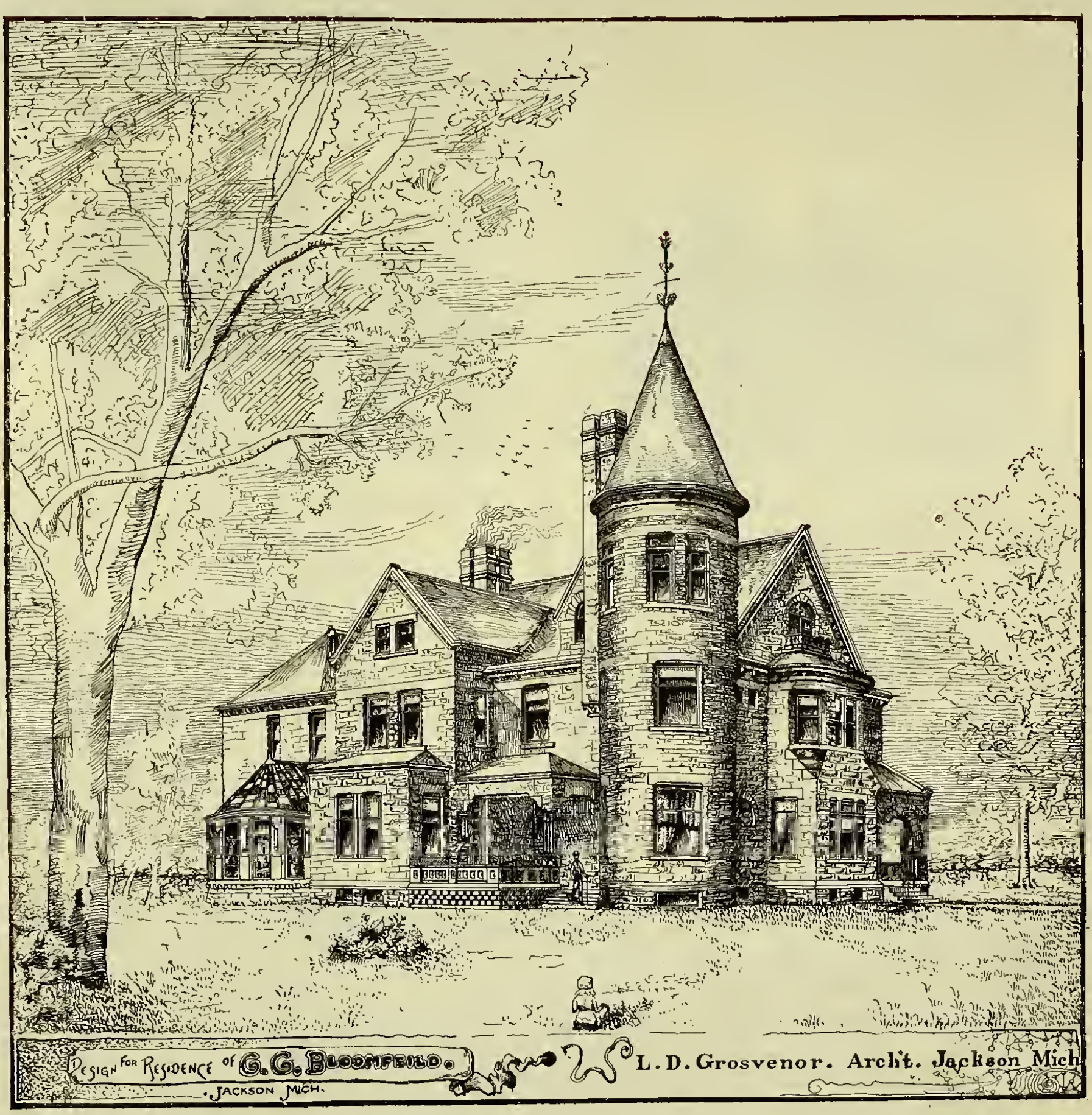
A Twelve Hundred Dollar Cottage.



Plan of First Floor.



Plan of Second Floor.



Winter Palaces.

Dr. B. W. Richardson, in a recent number of the *Asclepiad*, advocates the establishment of a series of winter palaces of health. Dr. Richardson's proposal is to erect in suitable localities a series of palatial residences of quadrangular form inclosing a large area of ground, covered in with glass, and filled with playgrounds tennis courts, sub-tropical gardens, and everything that can contribute to health and recreation of invalids who require protection from inclement seasons. The author sketches out one of these palaces of health on a certain scale. Fifty substantially built residences of two stories, to surround a square inclosure or gardens, accessible by four grand entrances. The two stories or flats would form one hundred residences, each 60 feet deep, 25 feet wide, and fitted with every convenience for the invalid, every room to be maintained at an equable temperature. Four galleries or terraces would be formed on the roofs, covered by glass, and laid out in flower beds, each gallery 20 yards in width and 100 yards in length, making a promenade of a quarter of a mile. The inclosure would be also covered by a roof of glass forming an inner garden, resembling the Crystal Palace. A library, reading room, concert room, theater, gymnasium, and baths would complete the idea, making it possible for the most delicate invalid to spend the severest winter months within its precincts. The suggestion of the palace of health or winter palace has been noticed with approval by the *Lancet*, which regards it as a "practicable idea," affording good work for the medical profession and encouraging native labor. The idea of Dr. Richardson has occurred to others, and has found partial embodiments in our winter gardens. The suggestion to inclose an area of park-like land, with residences on the flat system, is a vast improvement upon our hospital plan with its cooped-up yards and inter-pavilion spaces. That a large area of ground can be covered with iron and glass, and rendered equable in temperature during the winter months, and genial to the senses, has already been proved by the aerial fabric reared on the Surrey hills at Sydenham, which for more than thirty years has given pleasure to millions. The temperature maintained under this great glass roof is remarkable even in severe weather, as may be gathered by the gigantic ferns and palms that luxuriate at the tropical end of the palace. This building then affords a unique instance of an articulated structure of iron and glass that has withstood atmospheric influence in an exposed situation, and which in its proportions, grouping, and outline, despite adverse criticism, is a picturesque object in the landscape. Two of the primary conditions of health are light and sunshine, and if these elements can be abundantly provided with as little obstruction as possible, one of the great problems in the maintenance of health and vigor will be solved, and we shall have removed one of the chief difficulties in the construction of dwellings of the hospital class.—*Building News.*

Plans and Specifications.

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361 Broadway, New York.

[Rural New-Yorker.]

SILO BUILDING.

The silo experience of the past three years has been marked by somewhat radical changes, not only in cutting and storing the crop, but in the structure of the silo. The demand has been for a cheap silo, "a poor man's" silo, and as a result the wooden silo has come into use as a makeshift, possibly, between no silo and one of durable character. The stone or concrete silo is a structure adapted to places where sand and stone are dirt cheap; while the wooden silo is suitable for everywhere. The only question about silos of this kind is how long will they last; and those who have them say, "We have not yet found out." That a wooden silo must be a popular form arises not only from its cheapness in

Fig. 1.

building, but from the ease with which it can be built, and its adaptation to all sections of country where stones are at a premium.

While the wooden silo may be quickly built, it must at the same time be strong, and to that end the up and down studding should be not less than 2×10 inch stuff. When the silo is being filled the lateral pressure is great, and the studding should be put not over 16 inches apart, especially if the silo has a depth of 16 feet, which is now the general rule. The frame of this structure may be wholly of 2×8 or 10 inch stuff, or it may have six or eight inch square sills, and frame bents of square six or eight inch timber, filling in between them with studding, firmly fastening them to the sills and plates.

It is always best to have the bottom of the silage pit—the floor—on solid earth, and so a good way is to build a low stone wall, firmly bedding the sill into the inside face, as at Fig. 1.

It must be borne in mind that the silo must be made air and water tight, and so this wall may be filled in so that the bottom or the floor of the silo shall come above the surface, or it may have a grout surface. As a usual thing, the soil itself makes a good enough floor. All it needs is to be pounded down firmly, come up a few inches on the inside lining of the silo, so that the air cannot work under. This is readily seen in the illustration, Fig. 2, which also shows the method of lining the silo with tarred paper and two thicknesses of inch boards nailed to a 2×10 inch studding. This makes a solid air and frost proof wall, and is easily constructed, and will last for at least several years. The first lining of boards is of rough lumber, and it is then papered with tarred board, well lapped. The second lining of boards should be surfaced on the front face, and put on with a half lap, as seen, and this makes an air-proof wall.

As it is very necessary that the foundation of a silo

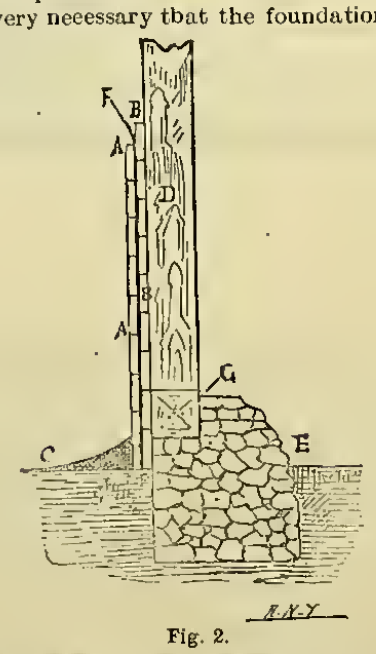


Fig. 2.

D, 2×10 inch studding, toe-nailed to sill, G. E, stone wall. G, sill bedded into wall. A and B, lining of the silo of inch boards. F, tarred paper between them. C, bottom of silo, coming up on the sides against lining board, A.

shall not spread, the method seen in Fig. 3 shows another excellent way, and the illustration plainly tells the manner of construction.

The matter of the frame settled the way of making the wall air-tight and durable is to be considered; and as good a plan for a cheap silo, and one which promises greater durability than boards or paper, is to dispense with the inside lining board, A, Fig. 2, and also the paper, and to lath and plaster the silo. The walls are first stripped up with lath on the board, B, about 16 inches apart and are then lathed in the regular way, and plastered with water lime cement, instead of white lime mortar, and smoothed up. This makes a cheap but durable wall, and one which the moisture of the silage cannot affect. The outside of such a silo—if built as a separate structure—should be covered, first, with tarred paper, and then siding. No sawdust should be used, as it is of no earthly use except to draw moisture and help rot the building. Silage cannot be frozen through the walls, and certainly not if a dead air space is made as described.

When room can be spared in the main barn, it is quite as well to sacrifice the big bay, and by taking out the floor, let the silo frame start from the ground. The studding can then be much lighter, but need to be as closely set. They can be backed against the frame of the barn, and will need no outside ceiling or paper, as the barn itself is its outside protection, and it may be built as described, or plastered, and I would, after some experience, recommend the latter, unless some kind of lumber can be found that will not decay.

In my own barn, which has a basement, the big bay was used. This gives me silos 18 feet deep, which can be readily filled from above, as the barn is built on a hill side. The doors of the silos open into the feeding stable from below. While feeding from the top, doors open on to the main floor, and the silage falls down a chute. At Fig. 4 a cross section of the barn is shown: *a* is the driveway into the barn; *b*, the floor; *c* and *d* are the silos, 16 feet deep, going down to basement floor, E. The doors out of the silo are seen, two above the floor and two below. A floor on the big beam, F, gives a large storing space above the silos.

If built out of doors, the silo needs a roof and also drainage against surface water, but protection against

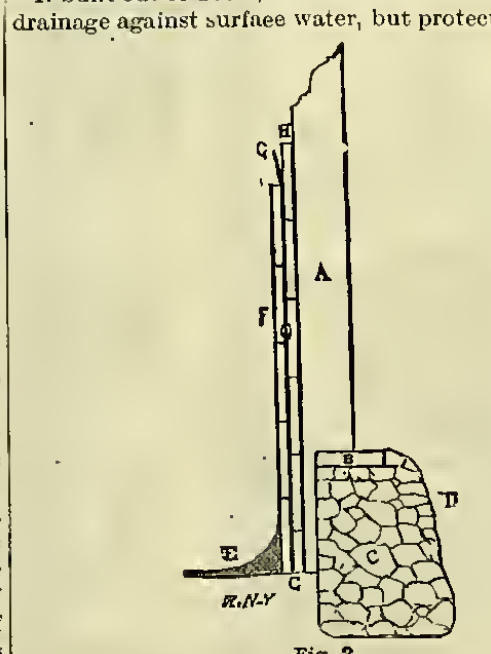


Fig. 3.

A, 2×10 inch studding cut with shoulder to fit wall. B, plank bedded into mortar into which to toe-nail the studding. A. C, stone wall, D, outside bank of earth. E, floor of silo of pounded clay or concrete mortar. F, inside lining of silo, inch lumber, surfaced. G, tarred paper, between double lining. H, inside lining of rough inch lumber.

frost is not needed, as a mass of from 50 to 400 tons of silage at 80° is its own protection, a fact that was amply proved in Wisconsin the past winter. The partitions in a silo must be well made, but I am inclined to think that where the silo is not over 14 feet in width, planks with two edges, resting in grooves at the ends, will be strong enough to hold the silage, for they can be placed in position as the silage is being cut in. After the silage has settled and becomes matted together, there would not be pressure enough to throw them over as our silo or pit is being fed out. When pit No. 2 is being fed out, the partition can be taken down a plank at a time. If this is not thought sufficient, then a row of 2×4 inch scantling can be set up with tarred paper on each side, over which siding can be put, leaving an air space between, and making a durable separation. A doorway can be cut through, and instead of doors, strips of boards can be put crosswise on both sides of the doorway as the filling progresses, and can be as easily removed when the feeding takes place.

The matter of preservation of the woodwork is of much importance. When the studdings go down to the ground, it is best to fill in between them to the depth of a foot or more with concrete made of four or five parts of sand to one of cement. This, if made thin, will act as a preservative of the wood, and exclude moisture. The facing of the silo can be either painted with a heavy coat of ironclad paint, a wash of two parts of kerosene and one of linseed oil, or a paste made of water lime cement put on with a whitewash brush—as many coats as the owner may desire. The second season, while the silo stands empty, there will be a considerable shrinkage of the inside boards, which the cement will tightly close.

It has been suggested that the wooden frame and an inside lining of boards, and then a course of hard brick up the interior, and over this a coat of cement, will be the coming silo, and with readily available lumber it could probably be built for about $1 per ton of storage capacity. I have in mind one silo that was built as described on 2×10 inch studding, and lined up with one thickness of boards. On this was put tarred paper, well lapped, and the silo was then filled, and the silage kept finely. Of course, the paper must be renewed each year, but it is not out of season to say that this may be a desirable inside lining for the silo, and on a small scale might be tried.

As Maj. Alvord has said, "Silos may be built with the usual building material, and may cost from 10 cents

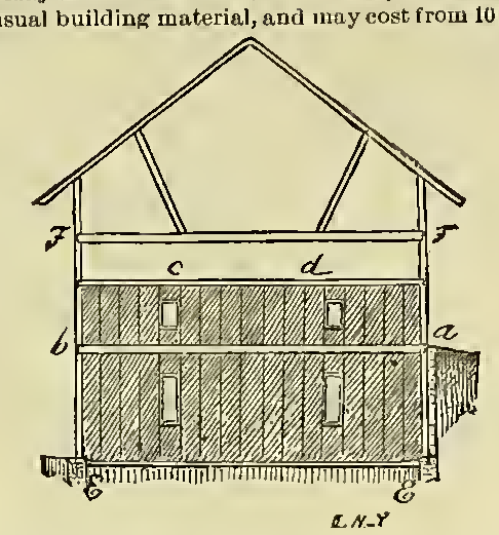


Fig. 4.

to $10 per ton, but cheaply built silos have been found to do good service." A No. 1 silo may be built for $1 per ton capacity, and will be found, for a few years at least, to answer all the requirements of a solid stone structure costing away up into the hundreds of dollars, and for this we have no less authority than Prof. Henry, of Wisconsin, who says about stone silos, "Don't build stone silos under any circumstances. Air gets to silage right through stone walls. Build of wood, with a good dead air space"

John Gould.

Portage Co., Ohio.

PEDESTAL TENONER.

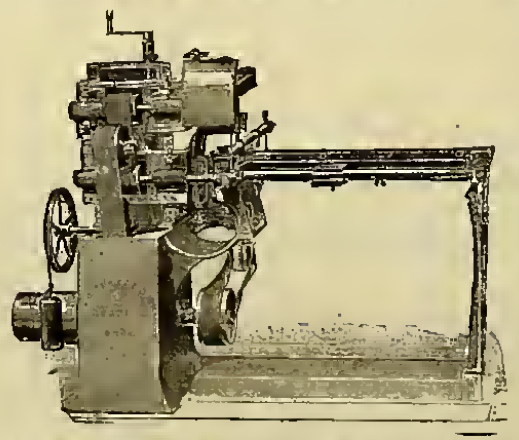
Messrs. C. B. Rogers & Co., of Norwich, Conn., the well known manufacturers of all kinds of wood-working machinery, have in this new machine embodied all of the best features of former styles of tenoners, and introduced some new and thoroughly practical ideas.

As will be seen in the cut, all the working parts of the machine are supported on a heavy iron frame, cast in pedestal form, and to which, at either side, are attached the boxes for the main countershaft. Attached to this column, and cast with it, is an arm with V track that supports one end of the carriage or table, the other end being supported by a smooth way attached to an extension of the foot or base. With this arrangement of the way the operator is enabled to follow the carriage right up, until the work has passed the cope cutters.

The cutter heads with straight cutters set for a draw cut are attached to heavy steel spindles, running in self-oiling connected boxes, to which are also hung the cope heads, the whole being gibbed to the upright.

By an ingenious arrangement, the heads are raised and lowered independently of each other, or may be adjusted together to any desired height above the carriage without altering their relative positions. The copes, being hung on the same yoke with the tenoning heads, when once set, require no further attention. They are, however, provided with both horizontal and lateral independent adjustment.

The pulleys on the cutter head spindles, as well as the main driving pulley on the counter, are placed between the bearings, and all the other pulleys placed close to



the bearings, adding much to the stability and capacity of the machine.

The arrangement of this machine is such that every necessary adjustment may be made from the operator's position in front of the carriage.

This tenoner is furnished with double head to work tenon six inches long at one cut, or single heads to cut three inches, and with one or two copes as desired.

We would advise any one desiring wood-working machinery to send for one of the new and very complete catalogues issued by this firm, which they will be glad to forward to any address.

STABLES WITH HORIZONTAL FLOORS.

The construction of our stables or stalls for the accommodation of our large domestic animals is not always such as it should be. To prevent the saturation of the flooring and the decomposition of the bedding, it has been the custom for a long time to pave the floor itself and to give to this pavement a certain inclination to accelerate the flow of water. According to this system, the pavements in the stalls often show an inclination of from three to six centimeters per meter, and often even more than this. It is to this fault that must be attributed the malformation of our cattle, the irregularity in the members, the weakness in the joints, the rapid deterioration of the limbs, and the general degradation of the race. The permanent dampness of the bedding affects the soundness of the feet of horses. The ammoniacal gases with which the atmosphere is saturated affects the eyesight and the respiratory organs. Fig. 3 offers a striking example of the sad effects pointed out. This represents a cavalry officer's charger of good breeding, but "over at the knees" and low at the withers, that is to say, deformed, and this, too, brought about by the inclination in the floor of the stable in which he was reared.

The problem of how properly to construct the floors of stables and stalls has fortunately been solved by Col. Basserie, a former member of the first committee on steeds. This system consists in an apparatus for drainage made of cast kennel stone, and sunk in the floor in a cement which is impervious to liquid. The drain is formed by being sunk under the surface, and having sides of kennel stone and a cast cover or lid. This cover has a slight longitudinal concavity smaller than the size of the shoe of the smallest horse, and having, furthermore, a series of apertures at the lowest point, made as small as possible, to enable the free flow of the water, and still made of such a size as not to catch or retain in any possible way the heel of the shoe. This type of strainer enables the liquid to flow into the drain, which can be readily cleaned, as the cover, being hinged, is readily removable. The separate drains of each stall connect with a main drain which passes along the end of the stalls, and this connects with a receiving cistern. Such, briefly, is the type of the stable Basserie

The advantages are very evident. Fig. 3, we have seen, shows an animal badly put up. Fig. 1 represents the same officer on another horse, which, although no better bred than the other, still shows much better traits, in that he was put on a horizontal floor before his growth was completed. The difference between the two types is very striking.

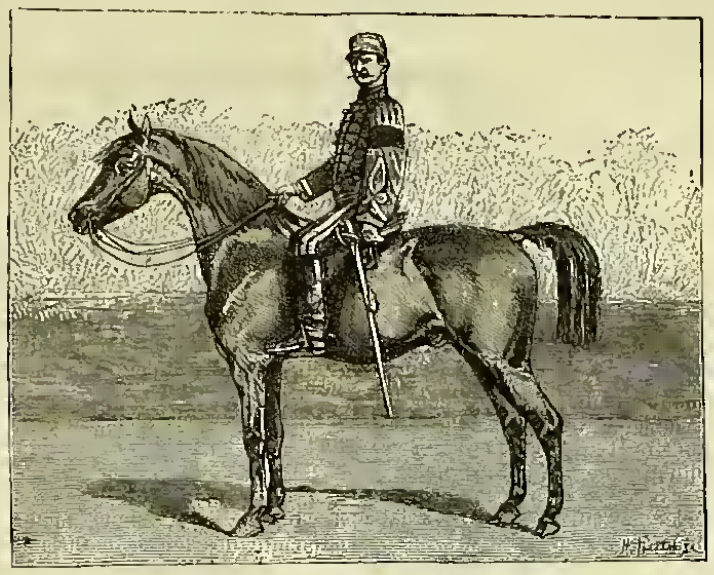


Fig. 1.—A HORSE IN GOOD CONDITION.

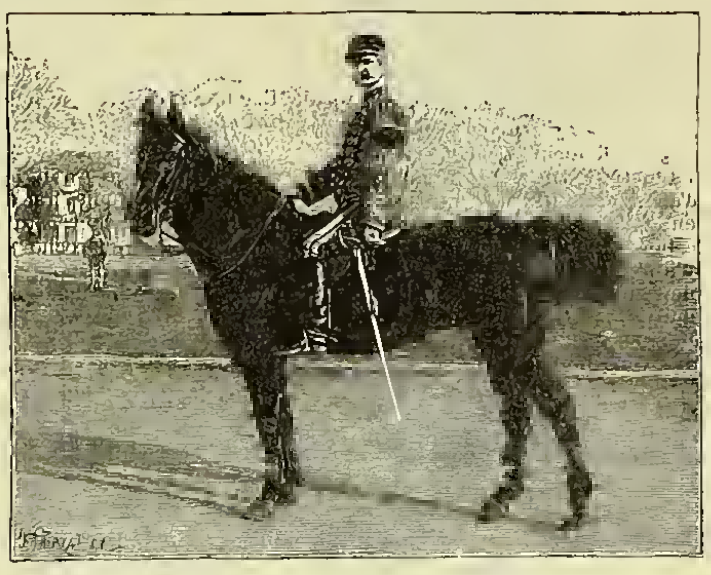


Fig. 3.—BAD EFFECTS OF INCLINED FLOORS.

Already applied in over forty departments in France, the Basserie system is very highly thought of. Fig. 2 represents the interior of a stable having a horizontal floor and hygienic drainage, built according to this system at Mans, for the section general of the fourth corps of the army. A similar system should be adopted in all our cavalry stables.—*L'Illustration.*

The Pyramids.

One of the leading granite men of the country, who has made a personal inspection of the pyramids of Egypt, says:

"There were blocks of stone in the pyramids which weigh three or four times as much as the obelisk. I saw a stone whose estimated weight was 880 tons. The builders of the pyramids counted human labor lightly. They had great masses of subjects upon whom to draw, and most of their work was done by sheer manual labor and force.

"There are stones in the pyramids thirty feet long which fit so closely together that you may run a penknife over the surface without discovering the break between them. They are not laid with mortar either. There is no machinery so perfect that it will make two surfaces thirty feet in length which will meet together in unison as these stones in the pyramids meet. They were undoubtedly rubbed back and forth upon each other until the surfaces were assimilated to each other."

Moulders' Sand.

The region around Albany, N. Y., furnishes the largest part of the moulding sand used in the United States. It is found in deposits from one and one-half to two and one-half feet deep, for four or five miles back from the river on the west side of the Hudson, as far south as Coxsackie, and on both sides of the Mohawk up as far as Schenectady. There are three grades, brass and stove castings using the finest, and bridge girders etc., the coarsest. Along the Mohawk it is shipped in bulk in cars, elsewhere mostly in canal boats and schooners; $500 per acre is often paid for the privilege of taking the sand from the land. In dry seasons it can be dug and shipped at once, but its quality is better when it is piled up and left over one winter.

Fig. 2.—STABLE WITH HORIZONTAL FLOORS AND HYGIENIC DRAINAGE.

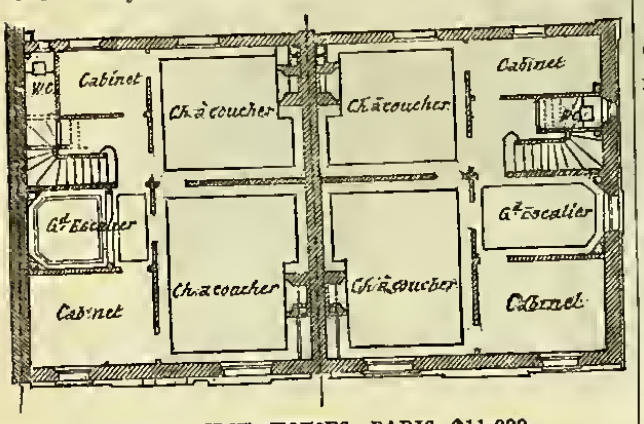
SMALL CITY DWELLINGS, PARIS.

We give illustrations from *La Construction Moderne* of a couple of small Parisian dwellings, showing the prevailing style. These are comfortable little houses. The pair could be built here for eleven thousand dollars, well finished.

Measurement of Masonry.

L. D. W., of Waverly, N. Y., submits a difficult question to answer. He states that a dispute lies between a certain party and a mason as to how rough rubble or foundation masonry is to be measured; whether any allowance is to be made for corners, or whether the calculation of the work done is to be based upon the total outside dimensions.

The custom differs in different places. Should the dispute go to a jury, the verdict, I believe, in absence of a definite understanding or written contract, would be given to the mason in accordance with the custom of the locality in which the work is done.



SMALL CITY HOUSES, PARIS—$11,000.

The custom in this city and also in Philadelphia is to measure all foundation stone and "dimension stone" by the cubic foot, and all sills, lintels, base courses, water tables, and ashlar by the foot superficial and by the foot lineal, but that does not seem to be an equitable arrangement.

Now, it seems to me that where all openings are deducted, and the work is paid for by the cubic foot of actual masonry, an additional price per superficial foot should be allowed for turning corners, and that this measurement should be as many feet upon each external face of the corner as there were feet in the thickness of each wall forming the corner. On the other hand, if no deductions are made for openings, no allowance should be made for turning corners.

No one can settle a dispute in which there was no definite understanding between the parties involved. My advice to L. D. W. is to figure out the actual cubic contents of the stone work, deducting, of course, all the openings, and allow the mason for turning the corners the same price as is paid for face work to rubble masonry per superficial foot. Thus for each corner it would be twice the height of the rubble wall multiplied by the thickness of the wall, when both walls are of the same depth; but should one wall be thicker than the other, then the height of the thickest wall multiplied by its thickness plus the height of the other wall multiplied by its thickness will give the true area required. Some arrangement of that kind ought to be made, for it is certainly more expensive to turn a corner than to lay a wall straight away.

Supposing there were no openings to deduct in the problem given, the actual amount of masonry would be 2,331¾ cu. ft., and the amount to be paid to the mason on the front wall extra for the two corners would be:

$$\left.\begin{matrix} 9 \times 2 \times 2 = 36 \\ 9 \times 1\tfrac{1}{2} \times 2 = 27 \end{matrix}\right\} = 63$$

sq. ft., and the allowance on the trench wall corners would be:

$$2\tfrac{1}{2} \times 2 \times 2 = 10 + 10 = 20$$

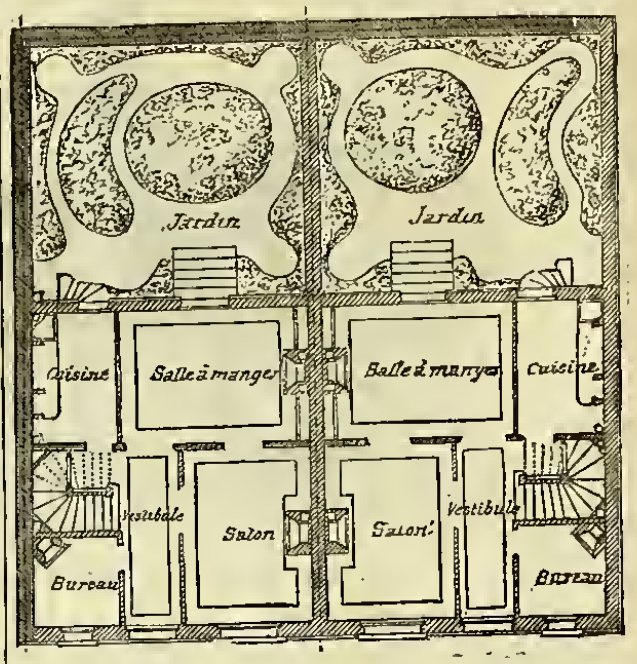
83 sq. ft.

Total allowance, 83 sq. ft. at the face work price to rubble masonry.—*C. P. K.*

Failure of Concrete Dock Works.

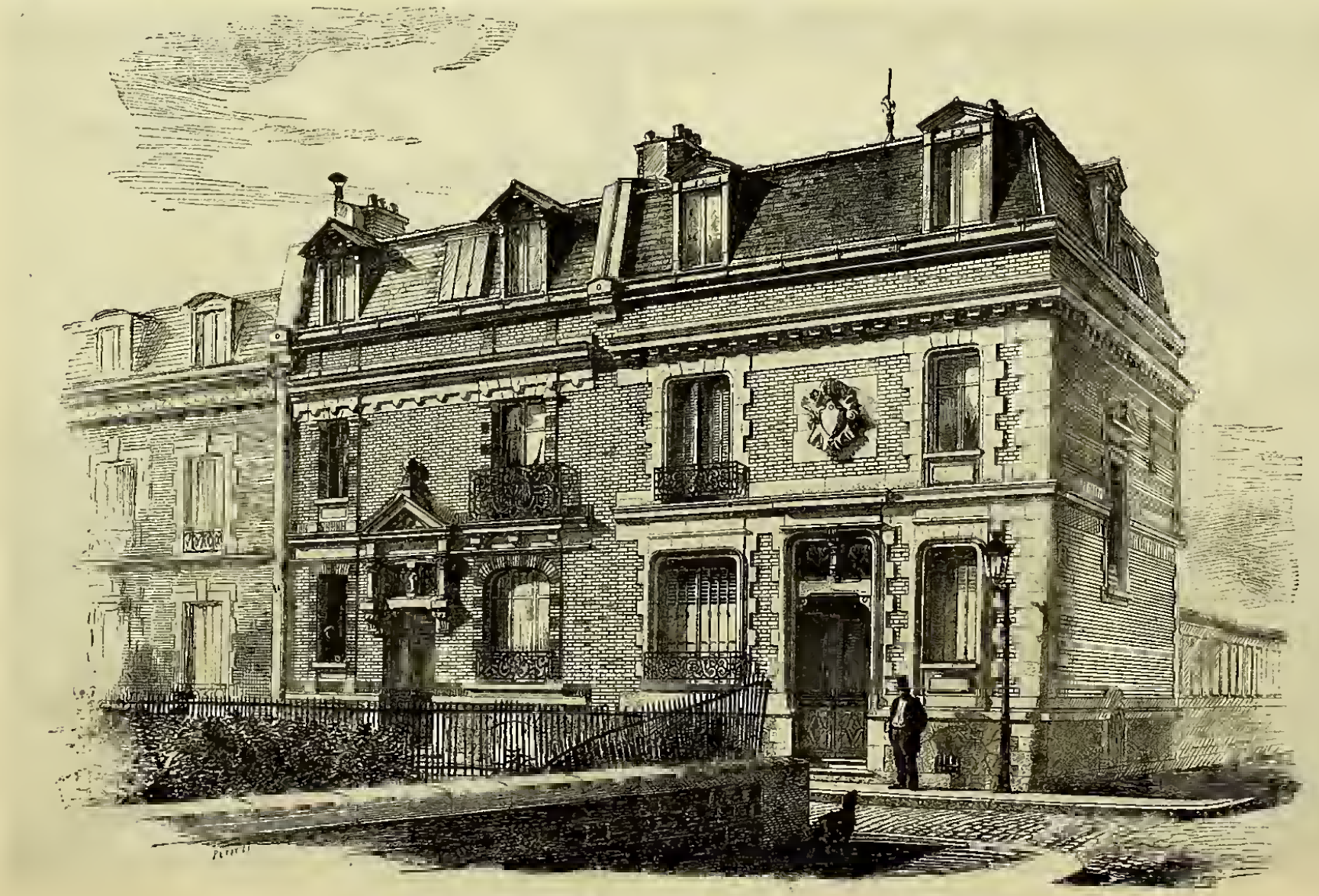
A matter of the highest possible importance and interest to all connected with the construction and management of harbors has been brought to light at Aberdeen. Two years since, the Aberdeen Harbor Commissioners opened a graving dock. The dock was formed of Portland cement concrete, the steps being lined with granite ashlar. A few months ago it was noticed that the concrete entrance walls, which are not lined with granite, had become swollen, and that the surface had begun to show cracks. Investigation as to the cause was at once made, and Mr. W. Smith, the harbor engineer, suspecting that chemical action was inducing the mischief, conferred with Professor Brazier, of Aberdeen University, who analyzed briquettes of the Portland cement used in the construction of the graving dock, and also samples of the concrete taken from the entrance walls of the dock. From the analysis made it appeared that the action of the sea water on the Portland cement itself, as well as on the cement in the concrete, caused an expansion and softening of the cement in consequence of the deposit of magnesia from the sea water, and also led to the formation of carbonate of lime by the union of the carbonic acid contained in the sea water with the lime in the cement. This somewhat startling discovery must necessarily receive great attention.

Within the past quarter of a century a great number of sea works have been formed of Portland cement concrete. At Aberdeen itself there is a breakwater of nearly a thousand feet entirely formed of concrete. In various ways it has required patching since its construction fifteen years ago, but the idea that its defects were due to chemical action did not occur to the harbor engineer till last year. He then mentioned the matter in a paper communicated to the Institute of Civil Engineers, the paper being printed in the first part of the Transactions of the Institute for 1886-87. The remarkable point in regard to the graving dock at Aberdeen is the rapidity of the chemical action of the sea water upon it as compared with the length of time that similar action has had opportunity of taking effect on sea works. We understand the greater effect is ascribed to the fact that the pressure of the water in the dock is much heavier than is the pressure of the water on the sea works. In the former case the pressure is from five to eleven pounds per square inch; in the latter it must be very light, except when the waves drive heavily against the works. Till the present time there does not appear to have been any investigation as to the chemical action of sea water upon concrete.



SMALL CITY HOUSES, PARIS—$11,000.

Now that science has been called in, and has made the discovery that concrete must give way before the sea, it will be the task of chemists to look out for some countervailing substance which shall prevent the decay that seems to be inevitable. It is something that science has shown the danger that is being run. It will redound more to the honor of scientific men if they can indicate the means by which the impending calamity can be avoided. The subject came before the Harbor Board of Aberdeen recently, and they resolved to hold a meeting of the whole board in committee to consider the matter.—*Dundee Advertiser.*

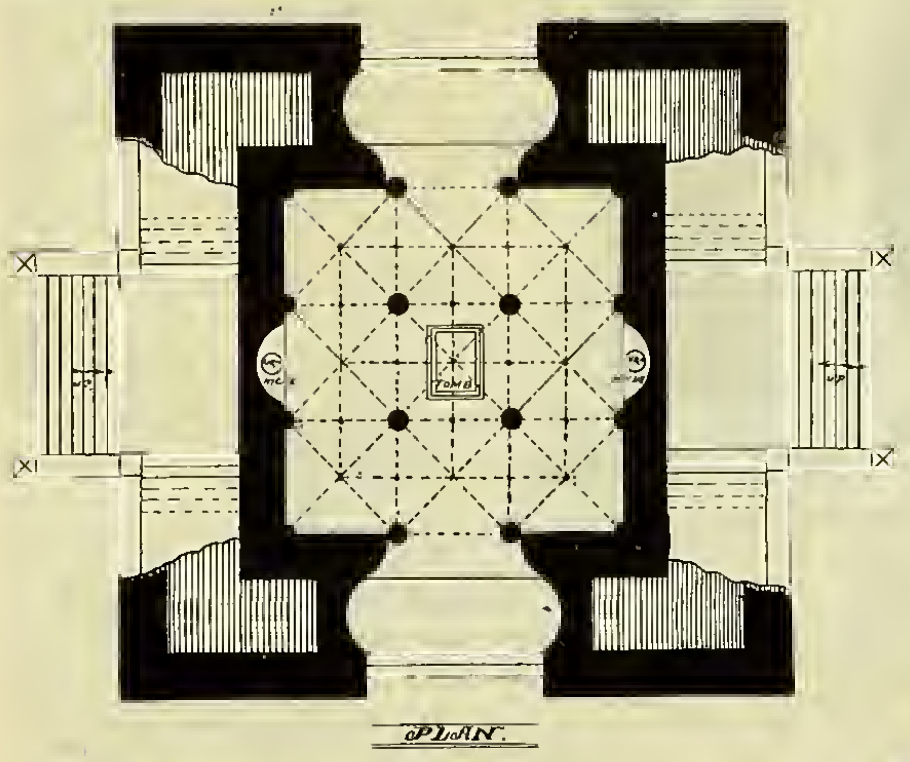


SMALL CITY HOUSES, PARIS—M. A. RENAULT, ARCHITECT.

MALE'S DESIGN FOR THE GRANT MONUMENT.

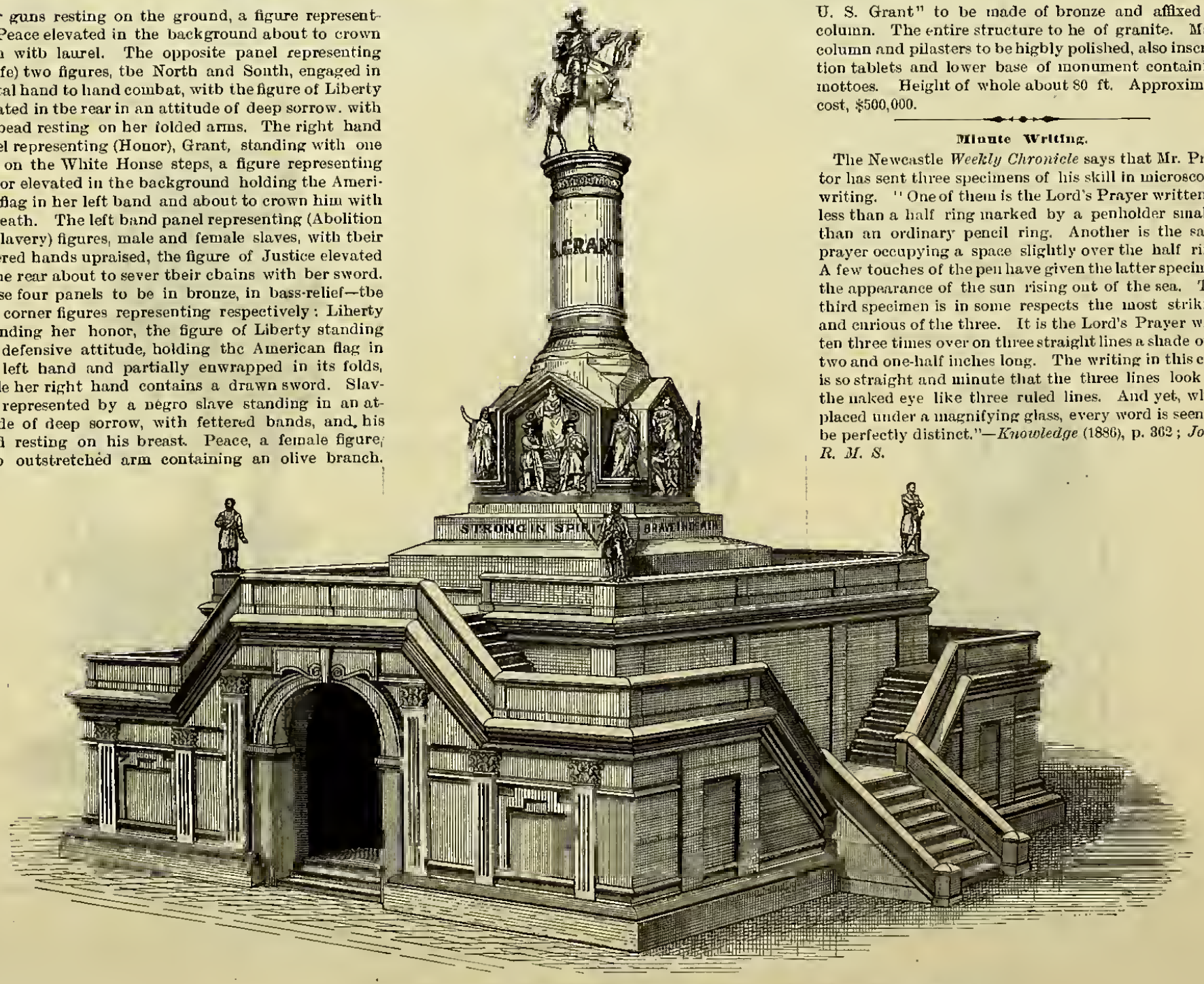
We present herewith drawings of the elegant design by H. A. Male, Albany, N. Y., for the Grant monument, to be erected in Riverside Park, New York. The following is a description:

Mausoleum.—Outside dimensions, 60'×60'; inside dimensions, 30'×30', containing the sarcophagus, to which we have access through two large arched entrances opposite each other, sarcophagus and surmounting figure (an angel with palm leaves) to be made of white marble. Ceiling of mausoleum to be rib-arched and supported by pillars, as shown by plan. The monument proper to be reached by opposite terraces, three in number, as shown by drawing. An equestrian figure of Gen. Grant, with drawn sword, surmounts the whole. At the base of the column we have four arched panels containing figures representing, first (Eternal Friendship), two soldiers, representing the North and South, standing with clasped hands with their guns resting on the ground, a figure representing Peace elevated in the background about to crown them with laurel. The opposite panel representing (Strife) two figures, the North and South, engaged in mortal hand to hand combat, with the figure of Liberty elevated in the rear in an attitude of deep sorrow, with her head resting on her folded arms. The right hand panel representing (Honor), Grant, standing with one foot on the White House steps, a figure representing Honor elevated in the background holding the American flag in her left hand and about to crown him with a wreath. The left hand panel representing (Abolition of Slavery) figures, male and female slaves, with their fettered hands upraised, the figure of Justice elevated in the rear about to sever their chains with her sword. These four panels to be in bronze, in bass-relief—the four corner figures representing respectively: Liberty defending her honor, the figure of Liberty standing in a defensive attitude, holding the American flag in her left hand and partially enwrapped in its folds, while her right hand contains a drawn sword. Slavery, represented by a negro slave standing in an attitude of deep sorrow, with fettered hands, and, his head resting on his breast. Peace, a female figure, with outstretched arm containing an olive branch. Prosperity, represented by a female figure supporting the horn of plenty in her left hand, with her face and right hand raised toward heaven in an attitude of prayer, thanking the Lord for his grace and goodness. On each of the four corners of the second terrace we have more figures, representing Grant as a scholar, with a book in his hand, absorbed in study; as a colonel before his regiment, standing in an attitude of attention, with folded arms waiting for the bugle call; as a general, in a commanding attitude, his right hand grasping a drawn sword, with his left hand on the scabbard; as a statesman, respresenting Grant holding a roll of parchment in his left hand, about to deliver an address. These figures to be in bronze also. On each four sides of the lower base of monument there will be an inscription as follows: 1st. "Strong in spirit." 2d. "Steadfast in friendship." 3d. "Patient in suffering." 4th. "Brave in death." These mottoes to be concaved on surface of base, the letters "Gen. U. S. Grant" to be made of bronze and affixed to column. The entire structure to be of granite. Main column and pilasters to be highly polished, also inscription tablets and lower base of monument containing mottoes. Height of whole about 80 ft. Approximate cost, $500,000.



PLAN.

FIGURE ON FRONT.



DESIGN FOR GRANT MONUMENT, RIVERSIDE PARK, NEW YORK—BY H. A MALE.

Minute Writing.

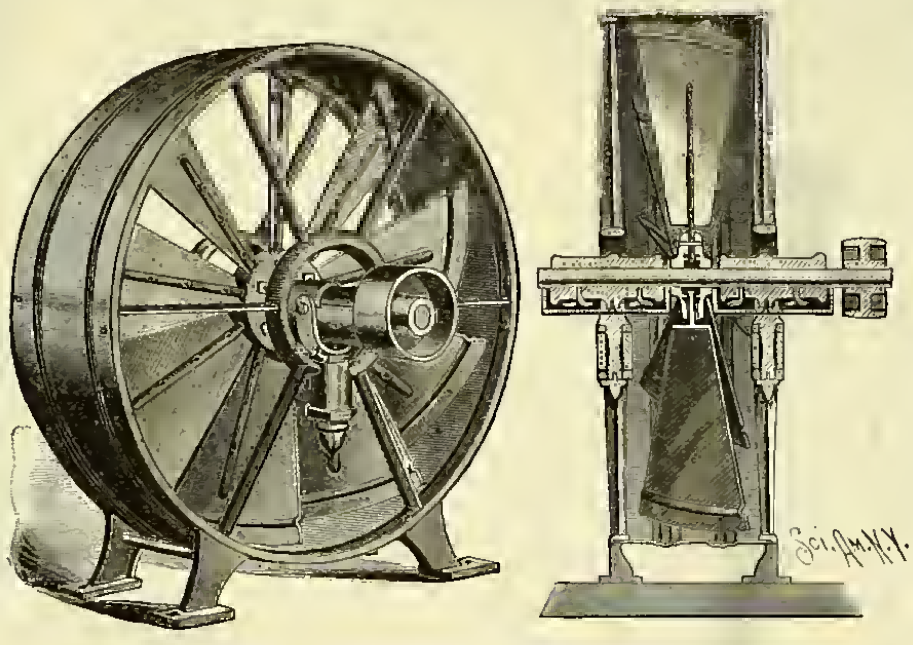
The Newcastle *Weekly Chronicle* says that Mr. Proctor has sent three specimens of his skill in microscopic writing. "One of them is the Lord's Prayer written in less than a half ring marked by a penholder smaller than an ordinary pencil ring. Another is the same prayer occupying a space slightly over the half ring. A few touches of the pen have given the latter specimen the appearance of the sun rising out of the sea. The third specimen is in some respects the most striking and curious of the three. It is the Lord's Prayer written three times over on three straight lines a shade over two and one-half inches long. The writing in this case is so straight and minute that the three lines look to the naked eye like three ruled lines. And yet, when placed under a magnifying glass, every word is seen to be perfectly distinct."—*Knowledge* (1886), p. 362; *Jour. R. M. S.*

AN IMPROVED VENTILATING FAN.

The illustrations herewith show a ventilating fan, and means for adjusting the hub thereof, by which the blades can be readily fixed at any desired angle of inclination, by simply loosening three nuts on bolts passing through the hub, thus increasing or diminishing the capacity of fan and power required. The hub is divided in two vertical sections, with opposing integral rings having a series of recesses, and a series of triangular projections with angular spaces between them, an annular recess separating the ring and projection of each section. When the two sections are united upon an axle, the flat surfaces of the triangular projections and the ring come in contact, forming a close joint, and a series of irregular openings in the edge, formed by the registering angular spaces. When the hub is slid upon the shaft, the fan rods are entered in the irregular openings, a groove in the rod being made to engage a concavity in the ring. The fans may then be given any desired inclination by turning the rods more or less to the right or left, when they will be held by the engagement of the lower portion of the rods with the ring, the two sections of the hub, when the rods have been placed in position, being held in positive, yet detachable, connection by a series of bolts.

These fans are so made as to be convenient for pipe connection, and a change of air current is readily effected by simply loosening the three nuts on bolts passing through the hub, and changing the inclination of the fan blades. The style of fan herewith shown can be placed either horizontally or vertically, the "feet" being such as can be attached overhead, on the side of buildings or partitions, or upon the floor.

For further particulars touching this invention, address the patentee and manufacturer, Mr. George P. Clark, of Windsor Locks, Conn.



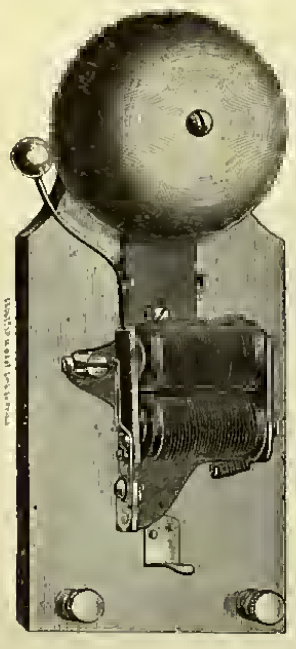
CLARK'S ADJUSTABLE HUB VENTILATING FAN.

THE SHAW & GEARY IRON FRAME BELLS.

We illustrate a new style of electric alarm bell into whose construction several features of good construction enter. The makers have been quick to recognize the weak points of ordinary bells, and have effectually remedied the defects incidental thereto in the one we now are describing.

From motives of cheapness, the frames of bells have hitherto been frequently constructed of cast iron. As this is acted on by an electric current, it acquires by induction a certain amount of permanent or residual magnetism; in electrical parlance, it becomes polarized and interferes with the action of the bell. The movements of the latter become weak and sluggish, and the addition of more battery does little to aid in overcoming the trouble. In the Shaw & Geary bell the iron parts are all made of the best Norway iron, a brand of world-wide fame for its softness and purity, and which cannot become polarized to any perceptible extent. Thus their iron frame does not at all affect the working of the bell.

The contact points are made of platinum and are



THE SHAW & GEARY IRON FRAME BELL.

riveted in place. This is a very important feature of construction, as if soldered or screwed they are liable to work loose. The binding posts are long enough to receive a double wire, and are made after the design of the English binding post. The resistance of the magnet is 3¼ ohms.

The manufacturers' address is Shaw & Geary, 53 North Seventh Street, Philadelphia, Pa.

The "Alderly" and "Penn" Old Method Roofing Plates.

Much attention has, within the last few years, been aroused upon the subject of the quality of sheet tin used for roofing. Many complaints have been made as to the quality of the iron and the thickness of the coating. It was made a source of complaint that modern manufacturing methods had brought about the production of an inferior, light-coated plate.

A return to the older processes was demanded, or, at least, a production of as good material as was then on the market. The manufacturers of the above brands have met this demand. They have introduced plates probably superior to anything yet produced, and whose qualities are so accurately specified by the makers that the purchaser knows exactly what he is buying. Thus the "Penn" plate is guaranteed to contain 40 lb. of tin in every box of 20×28 sheets. The sheets are guaranteed perfectly square and flat. This introduces an element of economy, as there is no waste of metal on account of untrue shape. Special shears have been adopted in the factory in order to secure this quality. They are also guaranteed to hold all the coating possible for any plate to hold, to last longer on a roof than any other old style plate, and to be perfectly assorted. The "Alderly" brand possesses all the merits of the "Penn" plate, except that it is not so heavily coated.

Gununey, Spering, Ingram & Co., 1023 Market St., Philadelphia, Pa., are the agents for these plates.

Gladstone Bricks.

Brick for the new court house being erected in Pemberton Square, Boston, comes from the yards of W. E. Gladstone & Son, Hawarden, Wales. Delivered in Boston, they cost $45.50 per 1,000. They are packed in barrels, each barrel containing only twenty-seven bricks, 9×4⅜×3¼ inches each in size. On the top and bottom of the brick there are groves 6¾×1¾ inches in size, 1 inch deep, designed to hold firmly the mortar when pressed into it. These products of an ex-premier's brick yard are warranted not to change in any manner with age, save to grow slightly darker. The process which is followed in their manufacture occupies thirty days.

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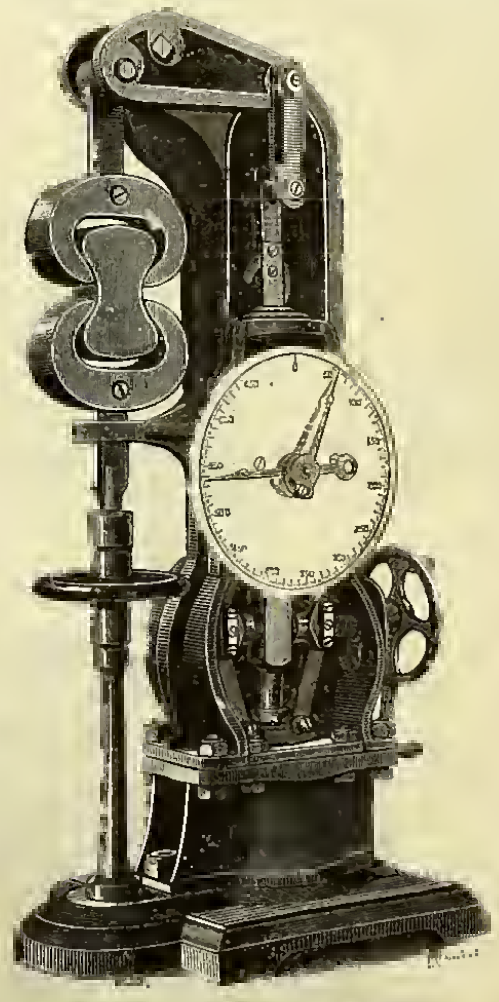
BRANCH OFFICE.—622 F Street, Washington, D. C.

CEMENT TESTING MACHINE.

The condition often imposed in cement testing, viz., that the strain shall be applied at a certain specified rate, necessitates a more regular application of the load than can be obtained by hand. In order to gain this end, various expedients have been adopted, such as using water or sand as the weight and allowing it to flow through an orifice into a vessel fitted to a lever. In more recent machines a weighted lever has been allowed to descend gradually by means of a cataract cylinder, so as to increase the leverage until the specimen broke, or a spring has first been weighted by a vessel of shot, and then the shot has been allowed to run out, relieving the spring and allowing it to exert a steadily increasing tension on the test piece. In Porter's cement testing machine, which we illustrate herewith, both a cataract and a spring are used, but the arrangement is entirely different from either of those mentioned above. On the base of the apparatus is a vertical oil cylinder having a piston in it. There is a valve which permits the oil to flow readily from the upper to the lower side of the piston, but it cannot return from the lower to the upper except through a passage commanded by a cock. On the top of the piston rod is a sliding frame on which is mounted a strong compression spring with its opposite end taking against a solid abutment. The sliding frame is also connected to the beam at the top of the machine by a tension spring, and the lengths of the two springs are so arranged that when one is loaded the other is relaxed, and *vice versa*.

Before a test is made, the piston, piston rod, and sliding frame are all raised together by means of toggle levers and a screw. These levers are pivoted to the cylinder at the bottom, and at the top bear against but are not connected to the frame. After the frame has been raised, the levers are screwed back, the oil in the cylinder meanwhile resisting the force of the spring, which has been compressed by the rise of the sliding frame. The sample briquette of concrete is then placed in the jaws, and the screw below them tightened to bring the index, which is connected by rack and pinion to the sliding frame, to zero. The valve is then opened, and the compressed spring forces down the piston at a regular speed. The extension of this spring produces an equal elongation of the tension spring which connects the sliding frame to the beam, and thus the strain is transmitted with a uniform increase to the sample until the latter breaks. When this occurs, the



CEMENT TESTING MACHINE.

flow of the oil is automatically arrested, while a loose index, pushed forward by its companion, registers the strain which has been applied.

The machine, which is made by Messrs Elliott Brothers, of London, is small and compact, and by its aid a large number of tests can be made in a short time. It is arranged for briquettes of one square inch in section.—*Engineering.*

SCIENTIFIC AMERICAN

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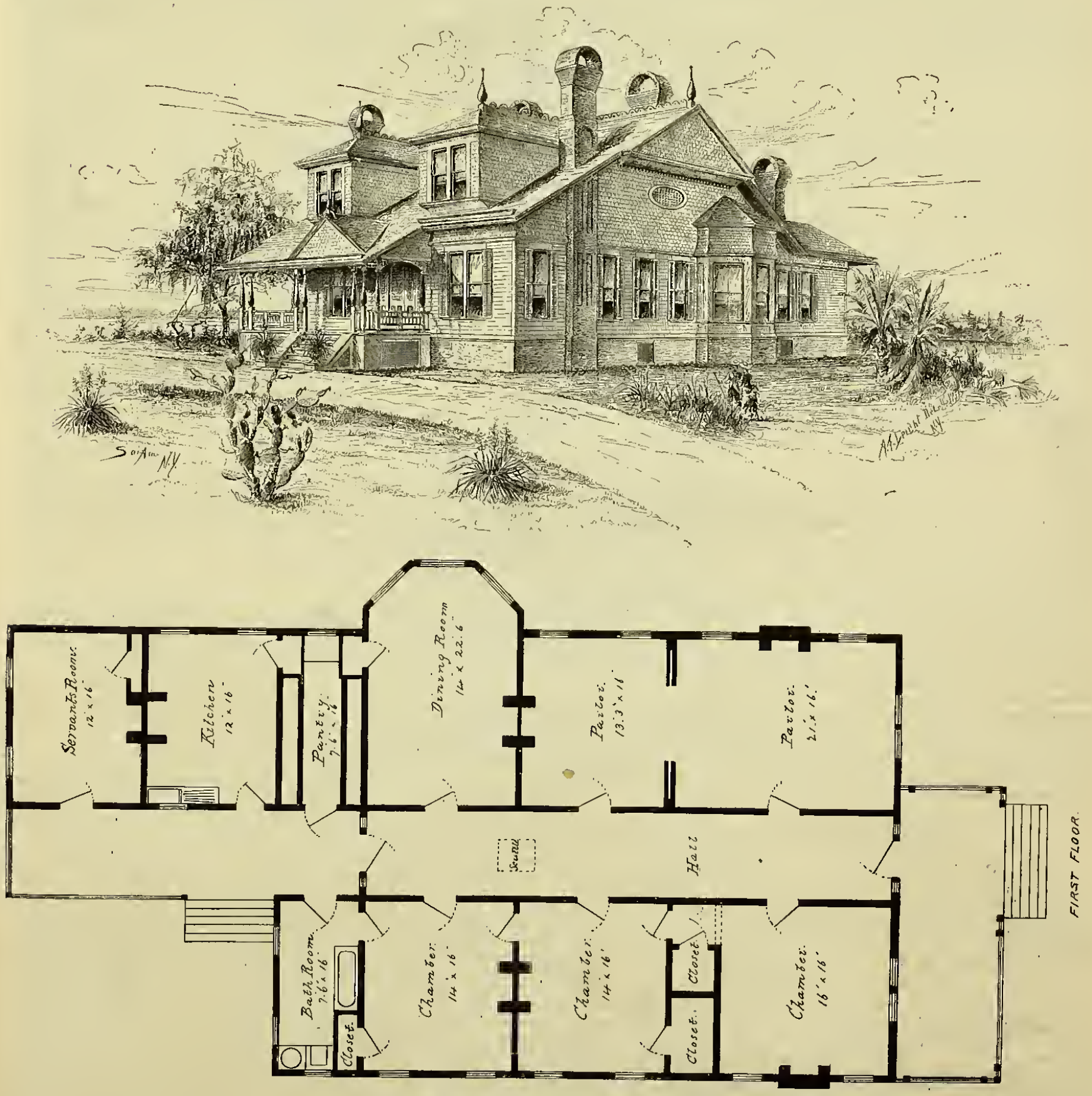

A ONE STORY SOUTHERN RESIDENCE.

[For description see page 83.]

Scientific American.

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O. D. MUNN. A. E. BEACH.

NEW YORK, OCTOBER, 1887.

THE

Scientific American,

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A RESIDENCE OF MODERATE COST.

One of our colored plates this month shows a residence designed for erection at the following cost:

Mason work and all excavation	$3,300.00
Carpenter, painting, tinning, slating, all complete	7,300.00
Plumbing complete	650.00
Heating complete	400.00
Mantel pieces, etc.	600.00
	$12,250.00

The following is an extended abstract from the specifications, and covers the most important features.

MASON WORK.

Excavations.—The cellar is to be excavated to an average depth of about 2' 6" below the natural grade. Trenches for all exterior foundations to be dug at least 3' deep, and all excavations that are necessary to carry out the plans, such as drains, piers, steps, vault, and other foundations to be well and faithfully done. The earth to be filled in and packed against the cellar walls after the mortar is dry, and level with the bottom of the underpinning. Also trench under foundation walls and interior walls and piers.

Drains.—All drain pipe to be of best quality glazed tile; size from leaders 4", to cesspool 5". These pipes to be properly graded. Make all joints clean and tight, of Portland cement, and make perfectly smooth on inside of same. Run a 5' line from inside of cellar wall to cesspool. Run a 5' line from cellar bottom to nearest outlet. All 4" drain tile from leaders to connect cellar drain.

Vaults.—Build privy vault where directed, with hard burnt Jersey brick, 8' thick, 3' deep in the ground, and leveled up to a grade 4' 8" by 6' in the clear. The whole inside, including the bottom, to be tightly cemented and made water tight.

FOUNDATIONS AND STONEWORK.

Footings.—Footing to be laid under all walls and piers, both stone and brick. All footing courses under stone walls to be of concrete 4" wider than the walls resting thereon and 4' high; well bedded in the top of this footing course, to come level with the top of cemented cellar bottom.

Foundations.—All footings, piers, foundations, and stone walls to be built to correspond with the sizes marked upon the plans. The stone used in the foundations to be of approved medium size stone, the lower courses to be laid with extra large, flat stone; all to be carefully bedded on their broadest faces; all laid in water lime mortar, composed of one part water lime and three parts coarse, sharp sand, each layer well filled and flushed up on both sides and firmly bound together. The foundations for steps, porch, piers, etc., to be built as above, and to extend at least three feet below grade. All the foundations for outside piers to be solid concrete and slightly taper from bottom up. The stone wall coming against the earth to be well cemented on the outside. Run a line of 3' unglazed tile all around foundation and to grade to cellar drain.

Stonework.—All face walls above grades to be laid with approved quarry stone, with vertical and horizontal joints. All to be carefully set and bedded on their broadest faces, well bonded together and backed with stone of same quality. All well laid in water lime mortar, as above specified, and cleaned off. The face stone to be pointed with red mortar made in the best manner, and cut joints on the outside and flush pointed on the inside with cement mortar. The foundation wall to run to top of the floor beams.

Cut Stonework.—All manner of cut stone represented on the drawings to be of regular broken ashlar, free from flaws and other imperfections, laid in cement mortar and pointed with red mortar. Also furnish all necessary cut stone for cellar windows and cellar door and sills coming under windows on high broken ashlar.

Brickwork.—All brickwork represented by plans to be of well-burned hard brick throughout, which must be laid wet in warm, dry weather, or if laid in damp, freezing weather, the brick must be kept perfectly dry. All brick to be laid up in best and most workmanlike manner, with mortar composed of good lime and clean, sharp sand, in the proportion of two of sand to one of lime, or of such other proportions as shall be considered desirable. All piers and walls to be built as represented by plans and of such dimensions as marked thereon.

The chimneys to be built and carried up as represented by the drawings, with good hard burned brick, laid in mortar as above. All flues to be struck joints on the inside and left free and clean on the completion of the work. All chimneys to be topped out as per elevations, with pressed brick. All the fireplaces throughout first and second stories to be pressed brick.

Bluestone.—Furnish and set in kitchen a rubbed bluestone shelf and hearth, to be the size as marked on the plans. Turn trimmer arches to all fireplaces.

Plastering.—The walls and ceilings of all the rooms and apartments where shown must be lathed and plastered with two good coats of sand, lime, and hair mortar, brown finish, and scratch coat an additional coat of white hard finish composed of best hard finish lime and plaster. All lime must be thoroughly slaked and made up at least eight days before using in the building. The whole job of plastering done in the best manner, and all repairing and patching, to leave the work in perfect condition, must be done at the completion of the building. The under side of all staircases to be plastered where required by the plans. All exposed plaster corners to have rule joint.

Plaster Cornices.—All the principal rooms and hall on first story to have cornice 8' × 10' as per detail, which will be furnished. Also set and furnish center pieces in each of said rooms, to cost $3 each.

Cellar Bottom.—The cellar bottom must be leveled off, pack and settle it thoroughly, and cover it flush and smooth with cement concrete 3' deep, in three parts of clean, coarse, sharp gravel and one part paste and cement, and the entire surface to be flushed up even and true, around the sides of the main walls or gutters, sufficient to carry all the water to the drain. Over the mouth of the drain place an iron strainer, and leave the whole job of work in perfect order.

Cesspool.—The cesspools will be built after the Waring system. All information must be ascertained from parties putting in same.

IRON WORK.

All manner of iron and blacksmith work necessary to make the whole job of work complete to be done and finished in a satisfactory manner, subject to the approval and direction of the architects.

CARPENTER WORK.

Timber and Framing.—First floor joists, 3" × 10", 16" from centers; second floor joists, 3" × 10", 16" from centers; third floor joists, 2" × 10", 16" from centers; ceiling joists, 2" × 8", 24" from centers; rafters, 2" × 8", 24" from centers; hips, 2" × 8"; partitions, 2" × 4", 16" from centers; bearing partitions, 3" × 4", 16" from centers; door studs, 2" × 4", doubled; wall plates and ties, 4" × 6"; bridging, 2" × 2"; sleepers in laundry, 2" × 4", chestnut; girders, 8" × 10"; sills, 4" × 8"; posts, 4" × 8"; girths, 4" × 6"; valleys, 3" × 8"; ridges, 2" × 10"; piazza sills and bearing timbers, 4" × 8"; piazza floor beams, 2" × 8", 20" from center; balcony beams, 2" × 10", 16" from center; collar beams, 2" × 8".

The girders will be kept flush with top of floor beams. Spike a 2" × 4" piece on each side of girder to rest floor beams on, and spike well thereto, and all other necessary timber required throughout the building, to be good, sound spruce timber, well seasoned, sawn true and square, free from sap, shakes, dry rot, or other imperfections. And all timbers used throughout must be prepared and framed according to the plans, sections, and details. All joists to have the crowning edge placed upward and sized to proper widths. Also prepare and size all studding, etc., cross bridge all joists at distances not exceeding eight feet apart. All trimmers and headers must be framed double, and in no case allow less than four inches between chimney breast and trimmers. The studding may be of hemlock.

Wood Lintels.—The carpenter must provide and set all wood lintels of every kind and description for all windows, doorways, and other necessary places. All lintels to have a bearing on walls of at least four inches on each end.

Partitions.—All partitions throughout and set studding to be set according to the plans. Bearing partitions on first floor must foot upon the girders below and be capped on second story with plate for the reception of

the joists. Bearing partitions on the second floor to foot upon plate. The studs at angles to be thoroughly spiked together before being placed in position. All doors to he trussed over the top thoroughly and substantially.. All partitions to be set to a straigbt edge. Joists in all cases to be doubled up under all stud partitions. Grounds put on for finish throughout the building.

Cutting for Pipes.—The earpenter must do all cutting for pipes of all kinds, using eare not to cut off or weaken supporting timbers, and furuish all necessary pipe hoards for the plumber to screw his pipes to.

Sheathing—The building to be sheathed on the outside with sound, match ⅞" hemlock hoards, not to exceed 9½" in width, nailed to every bearing through each edge with 10d. nails; tbese boards to be placed on frame diagonally.

Lumber.—The lumber to be white pine, unless otherwise specified. All inside finishing lumber to he clear and dry, free from sap, shakes, or knots, pitch, etc. Piazza coluums to be whitewood. The bath room and water closet fittings will be of cherry.

Exterior Finish.—All of the exterior finish for corner hoards, window and door casings, cornices, water tables, verandas, bands, sidings, and all manner of finish shown on plans and details to be composed of clear white pine, well seasoned, and primed as soon as put up. Shingle the vertical sides where shown on the plans with 6"×18" pine shingles, laid not more than 5" to weather and cut to pattern.

Furring Strips.—Do all necessary furring of every description. The walls in laundry will he plugged and properly furred off ready for lathing. Ceil the underside of back piazza with ⅞×3" strips planed pine, kept ⅛" apart, no tongue and groove.

Roofs.—All roofs to he covered with rough hemlock boards 1" thick, with good square edges, and of even thickness. All of the rough carpentry necessary to form the projection of eaves, as required for all cornices, gutters, etc., to be done in accordance with the plans and details. All to be composed of good, sound lumber, and put on in a good, substantial manner. All roof hoards to be well nailed with 10d. nails. Joints broken at various places. All main roofs to be covered with the best quality of Chapman quarry black slate, 16"×8", not less than 3" lap. All the outer edges on gables to be laid in mortar. These slates to be laid on carbonized felt and nailed on with galvanized nails.

Floors.—All floors, when not otherwise specified, to be of white pine, free from sap, sbakes, black, unsound, or loose knots, mill worked, tongued and grooved, one ineh thick, not over 4½" wide. The loft floor may be 9½" flooring. All well and secret nailed to each joist. The porch floors to be white pine, tongued and grooved, ⅞" thick, not more than 3" wide, and all joints to be well laid in white lead. The kitchen floor to he composed of white maple, tongued and grooved, ⅞" thick, not more than 2½" wide. All the floors to he composed of lumber, the best of the several kinds specified, and all well and secret nailed to every joist. Also the bath room and water closet will have maple floor, same as kitchen. The floor in laundry will be of yellow pine.

Doors.—All doors in the house, except where otherwise specified, to he made of clear, dry, white pine, free from sap, and must be in strict accordance with the drawings. Size of doors to be marked on floor plans for width, height, etc. All doors tbat are marked on plans as sash doors to have proper rabbets for receiving glass and suitable provisions for same with beads, etc., etc.

All necessary dwarf doors to he provided where needed for pantries, closets, wash stands, water closet, etc., paneled or batteued and beaded, as the case may require. The front and vestibule doors to he made of white pine, to correspond with the sizes and dimensions given on plans. All other doors required by the plans to be made in the best manner, and of good, sound, clear, kiln dried lumber.

Tbe sliding doors to be hung with Warner's patent door hangers, the track boxed in as per furnished directions. The double doors to have astragal joint in center, all to he well and securely done. Pockets for sliding doors to be made perfectly air tight.

Hinges.—Hang all doors tbroughout with loose joint butts of sufficient size to throw them clear of architraves. Butts on front doors to be of plain bronze 5"×5", three to each door. Butts on principal rooms and hall to be of 4½"×4½", plain bronze. All doors to have 4½" saddles and base pins where needed. All dwarf doors throughout to have suitable butts to match other work, and all door butts to be loose pin joints. All the room and hall doors on principal part of first story to be real bronze plain knobs, roses and escutcheons, front doors to have plain bronze knobs and escutcheons and roses combined. Doors on second story and kit hen to be 4"×4" lacquered butts and jet and brouze knobs. All other doors throughout to have plain iron butts and white porcelain knobs and escutcheons. Sliding doors to have real bronze flush trimmings. Put suitable knobs on all dwarf doors, press doors, etc. The principal part of first story to have bronze face mortise locks The main entrance doors to have a 6" mortise lock, night latch attachment, with tbree keys, and to have real bronze fronts and striking plates. All doors in principal part of first story to have a first quality 4½" mortise lock, real bronze front and striking plates. Sliding doors to have locks with astragal fronts of real bronze and flush furniture. All small closets, presses, drawers, etc., to have suitable locks as approved. All door locks throughout to be of the hest city manufacture, and all doors to have a key.

All double doors to have sliding holts at top and hottom, and to correspond with other furniture. Front doors to have mortise holts of suitable size and finish, to be of real plain bronze. Also put bolts on the outside doors in cellar and laundry.

Picture Moulding.—Put up 2" picture moulding in all principal rooms and halls, first and second stories.

Window Frames and Sash.—All window frames constructed to correspond with the working drawings for same. The sash to be size as shown, and 1¾" thiek, and huug on hraided sash cords, weights, and noiseless axle pulleys. All glass to be well bedded, bradded, back puttied, and cleaned off. All provided with best approved hronze sash locks and lifts. All made of clear white pine, well seasoned. The cellar windows constructed in accordance with tbe details for same, and the sash to be all hung on back flaps and secured with books and staple and protected on the outside with ⅜" rods placed vertically 3" apart. The dormer windows to be constructed in accordance with the detail drawings, secured in a thorough manner and proof against leak.

Glass.—The glass in front first and second stories to be French polished plate, other rooms in principal part of first story and entire second story to be 26 oz. sheet glass, the balance to he first quality French sheet double thick. Furnisb and put in stained glass where shown on the plans, design selected by the owner. Allow for this glass, $1.50 per sq. ft.

Blinds.—All windows, except two hays in second story and hay in front of parlor, to be provided with outside blinds made of the best white pine, all hung on wrougbt hinges and trimmed with approved hlind fasts. The windows mentioned above to have cherry Venetian blinds with cornices complete.

Hardware.—All hardware and trimmings used throughout to he the hest of the kind specified. Furnish all necessary bronze hardware for bath room.

Interior Finish.—All to be constructed as required by the plans and details, with sound, clear, kiln dried white pine, unless otherwise specified. All put up with neat, close joints, smoothed up and well sandpapered. Base put down in all apartments which are not wainscoted. Beads to be put on all corners, the hath room and water closet to be fitted up with cherry. Panel backs under windows of first and second stories and stair platforms. All windows, including those that bave panel backs, to have neat stools and aprons.

Vestibule.—The floor in vestibule will be an ornamental tile floor, selected and put in by the owner.

Stairs.—All stairways to be huilt where located on plans. The main staircase to be built and supported on tbree plank strings, the risers to be 1" thick and the treads 1¼" thick. Dimensions in all cases for height of risers and width of steps to be measured from the building. Tbe space under stairs to be finished with a neat cherry panel. All stairways must be put up after the plastering is dry. The attic and kitchen stairs built as required by the plans, of a good quality of stock, to be well supported on two plank strings, to have 1" risers and 1¼" treads, well housed into wall string. The main stairs to be selected cherry.

Newels, Rails, and Balusters.—The newels, rails, and balusters for main staircase to he of selected dry cherry, worked in accordance witb the detail drawings. The kitchen stairs to have two iuch round cherry newel and rail. All cellar and outside stairways to be built on good, strong plank strings, provided with plank steps of white pine, well put up and thoroughly secured. The main newel will be 10 × 10 base, 8 × 8 shaft, turned and chamfered, main rail 3 × 3¼", balusters 2½ × 2½, square and turned; tbe newel on second story for kitchen stairs 5 × 5, square turned rail for same 2½ × 3½, and 2" turned balusters; furnish and put in steps from third story to loft.

Closets.—The closets to be ventilated by means of a hollow 3" tin tube placed in partition and running up to air space above the loft floor. Also in hedroom closets to have two rows of double wardrobe hooks, placed on beaded cleats and two rows of shelves put in across the top and back and sides where space will permit.

Kitchen Pantry.—The kitchen closet to be fitted up with five shelves on the back, about 14" wide, shelves on each side to be of ⅞" lumber. Put in hanging hooks in space at head of cellar stairs. Fit up butler's pantry as shown, to have counter shelf, with small doors or drawers below, as directed, and small glass doors above these lockers. To have small moulded cornice run around the top Furnish and set all necessary hardware to make the job complete and to match tbat in its immediate vicinity. Closet under main stairs to he fitted up as directed, the drainer in butler's pantry to be white ash. Put small door in front of sink.

Kitchen Sink.—The sink to be ceiled up underneath with narrow beaded battens, and provided with door of same, fitted and trimmed with the required hardware.

Wainscoting.—Wainscot walls of kitchen, bath room, laundry, and water closet with beaded battens, 2½" wide, and cap with a neat beveled and moulded cap. The bath room and water closet to be of cherry and the kitchen and laundry white maple, all to be 3 6" high and 20" above the fittings.

Mantels.—The mantels, either slate or wood, will be furnished by the owner and set by tbe contractor.

Bathroom.—Bath tub to be cased up in a good and workmanlike manner. Tbe water closet to be fitted up with cover, seat, and riser. Hang the seat and cover with brass butts. The whole should be put together so that at any time it may be easily taken apart for the purpose of attending to or repairing the pluuibing pipes. Fit up the wash bowl underneatb with narrow ceiling, 2½" wide, and provide batten door of same, properly fitted, binged and trimmed with appropriate butts and eatches. Also fit up other wash howls throughout in same manner.

Ventilation.—Put in all chimney flues where possible, 8 × 10 ventilating registers in all chimneys and rooms not having fireplaces. Also put 8 × 10 register in kitchen chimney for ventilation.

Bells.—Put in an electric bell from front door to kitchen, also from second story ball to kitchen and from one room to girls' room third story.

Cold Air Ducts.—Build cold air duct of wide pine ceiling hoards as directed by the beater men.

Coal Bins.—Build coal bins in cellar of planed and matched spruce boards, with strong stanchions, and leave small doors.

Privy.—Construct a privy of frame clapboards, corniced and have a slate roof. Furnish a panel door, one window, and seats with hinged covers complete, and 5' ×5'×7' high.

Tinning.—All the flat roofs must be covered with the hest M F charcoal roofing tin, laid with flat seam. The gutters to be properly lined, and run the tin up under tbe slate or shingles at least 6". Bring the tin over the face of the cornice and tack it down smoothly. All angles and other necessary places to be covered with tin as above, all well soldered in resin and made perfectly water tigbt. Leaders of XX tin put up as indicated on plans, or as may be directed, with all necessary curves, breaks, bends, etc., to carry the water from the several roofs to tbe ground, and connect tde drain, which will be put in by the mason.

PLUMBER'S SPECIFICATION.

Drain.—Furnish and put in wbere shown on the plans a 5" cast iron soil drain pipe, to run from inside of building out to the tile drain, 4' 0" outside of the building.

Soil.—Furnish and connect with the soil drain in cellar a 5" cast iron soil pipe and run same size up and out of roof at least 4' 0" and cap the same with the "Smith" patent ventilating cap. Use Y branches for all waste connections. All the iron soil pipes to have a coat of asphaltum. The soil pipes to have a cleaning out cap in cellar.

Calking.—All joints of all iron pipes are to be thoroughly calked with picked oakum and molten lead and screwed in position with iron hooks. All joints between iron and lead pipes to be made with brass ferrules, to be calked into iron pipes and tbe lead pipes to be soldered to it with wiped joints.

Boiler.—Furnish and put up where shown on tbe plans a 35 gallon round head, heavy pressure copper boiler, and provide with draw cock for emptying the hoiler, and shut-off cocks for shutting off water from second story, and provide with circulating pipe, complete. Connect hoiler draw cock with the sink waste, bave a ⅝" stop cock on supply pipe, and combined safe and vacuum valve on top of the boiler. Boiler to be supplied with a Lockwood stand.

Supply.—Tap and pay for tapping the water main and connect a ⅝ AAA supply and run to the boiler. Supply to have a shut-off cock inside the cellar wall. All pipes are to be graded so they will drain perfectly dry. Each floor to be controlled separately by shut-off cocks. Where pipes will not drain dry, put a small pet cock. Run a ⅝" AAA lead pipe to and through cellar wall to a point where directed, and furnish and fit a stop cock hotb on the inside and outside of the building.

Sink.—Furnish and set up where shown in the kitchen an 18"×30" Mott's Eastlake galvanized iron sink, with back air chamber and iron legs, and supply with hot and cold water through ⅝" AAA lead pipe. and Fuller cocks, and have a 1½" X lead waste pipe, properly trapped and connected with the drain, with a 2" iron pipe to the main soil pipe. To have a cleaning cap on end of pipe under sink. Also fit in complete in butler's pantry one copper sink, 16×20, and supply with hot and cold water through ½" AAA lead pipe, with nickel faucets and waste connection complete.

Bath.—Furnish and put up, wbere shown, a 16 oz. sheet copper bath tub, 5' 6" long, well tinned and planished. Supply with bot and cold wator tbrough ⅝"

AAA lead pipe and nickel plated combination bath cock with rubber spray. To have 1½" C waste, and properly trapped and connected with the soil. Bath to have nickel plated plug and chain. Overflow to be connected with waste.

Bowls.—Furnish and set where shown on the plan three 14" marble Italian ware wash bowls, with marble countersunk top and sub-bases 10" high. Supply with hot and cold water through ½" AAA lead pipe and nickel plated Fuller patent hasin cocks, to have 1¼" X lead waste, properly trapped and connected with the soil, to have nickel plated chain and stay and plug.

Air Chamber.—No cocks to be placed at the end of a line, but the pipe to be extended so as to form an air chamber.

Closet.—Furnish and set in the second story where shown on plans, supplied with water through 1¼" pipe from cistern above, an inodorous porcelain wash out closet, with suitable size cistern. The cistern to have the flush tank attached. Supply through ⅝" AAA pipe and have cistern valve and rubber ball complete. Ventilate the closet with a 3" lead pipe connected with the iron vent. Closet cup and pull to be nickel plated and to be inserted in the seat. Closet to have enameled drip tray.

Safe Pans.—The bath tub, bowls, and closets are to be provided with 2½ lb. lead safe pans, edges turned up 2" all around, and to have a ¾" lead waste pipe to the cellar.

Wash Trays.—Supply the wash trays with hot and cold water through ⅝ AAA lead pipe and Fuller patent cocks, with flange and thimble. Provide with a 2" main waste pipe, properly trapped and connected with main soil pipe, also all necessary plugs and chains and flanges, also provide on end of pipe a cleaning cap.

Ventilation.—Every trap through the house to be separately and independently ventilated from the crown, by the same size as the trap.

Gas Pipe.—Put up the gas pipes with outlets where shown on the plans and according to the rules of the gas light company. All outlets are to be capped and all pipes tested. All side lights are to be not less than 5' 6" from floor. All drop lights are to be hung plumb.

A COUNTRY STORE.

One of our colored plates represents a country store and family flat lately erected in an adjoining town, at a cost of thirty-eight hundred dollars. We make liberal extracts from the specifications, which, with the plans, will enable any intelligent builder to duplicate the work.

Quality.—All material used to be of good quality, free from all defects impairing its strength or durability. All timber, except where otherwise specified, to be of good and as well seasoned as the market will afford, square edged and full size hemlock or spruce.

Size of Timber.—The first and second tier of beams 2×12×16" on centers. All headers and trimmers to be doubled and well spiked together. Tail beams mortised and tenoned together. The end of the beams to be cut on *slight* bevel, as indicated on the plans. The girts for trusses to be 6×8. Truss rafters, 6×8. These trusses made as indicated on the plans, fitted on top and bottom, and bolted together as shown. Bolts to be ⅝, and large square washers at each end. Put in 6×8 summer in cellar, where shown on the plans. The filling between the trusses to be 2×6, placed five spaces in the length of rafters, and let into the rafter 1", and sized to 5½", and well spiked thereto. The ceiling beams 2×6, placed nine spaces in width of building. These to be cut between truss girts and notched and rest on a 1×2 furring strip, and all well nailed. The plate will be 3×8, laid flat on wall and bedded thereto. The truss girts spiked well to plate. There will be a regular truss on the extreme end of front. The iron rod for these trusses will be ¾" iron, with large square washers on each end.

Cross Furring, etc.—The entire second story ceiling will be cross furred with 1×2 furring, placed 16" on centers and nailed in each and every nailing with tenpenny nails, and joints broken at least every sixth one. The outside walls of both stories to be furred with 1×2 furring. The second story 16" from centers, and the first story 24 on centers, and nailed in every dry joint left for that purpose by the mason. Use twelvepenny or twentypenny nails, as the case may require.

Bridging.—Bridge the first tier of beams three rows intermediate between summer and outside wall, with 2×2, cut in accurately and well nailed at each end with tenpenny nails. The second tier to be bridged with same material and same manner except located differently. Run a row between the two stair partitions, and two rows intermediate between stair partitions and outside wall. All these to be regular cross bridging.

Partitions.—Set partitions where indicated on the floor plans. The stair partitions on first story will be set with 3×4 joist, placed 16" on centers, and have 3×4 cap and run down to summer, and well nailed at each end, and bridged horizontal twice in their height. Partitions in second story set as shown on the plans, with 2×4, placed 16" on centers, and bridged once in their height horizontal, and accurately cut in, and well nailed. These partitions to have 2×4 cap. All partitions to be set perfectly plumb and straight. All door openings to be double studs, the inner one to be cut off so the door head will rest thereon. All door beads running across floor beams to be doubled, and the whole well nailed together. Also put in blocks at bottom of door studs to make end nailing for bases. Thoroughly spike all angles and corners together, and do not allow the lath to run behind.

Roof Covering.—Cover the entire roof with surfaced hemlock boards, perfectly dry, and nailed in each and every nailing.

Flashing, Tinning, Slating, Leaders, etc.—Tin the whole entire roof with 20×14 I. C. charcoal tin, well soldered and nailed. Turn up not less than 6" against the front work. Lap over large board on rear, and nail in face, and well nailed on top of scuttle frame. Work in all necessary flashing around chimneys and around the front cornice, also tin the balcony floors, well nailed on the edges and well worked in the brick work, and turned up well against bay. Line the gutters on main roof. Turned over on front edge of cap, and nailed on face. Do all necessary tinning of every description to make the job complete and perfectly tight. Also do all necessary flashing whatsoever to make job complete. Furnish and put up on rear of building two 4" leaders, round, made of XX tin, connected to *tubes*, and fastened with strong iron hooks in joints of brick wall, and connect with tile, which will be put in by mason.

Slating.—The hood in front of roof will be slated with black slate and a red slate figure in the center. These slate to be not more than 16×8, laid with a 3" lap.

Scuttle in Roof.—Form scuttle in roof where directed 2'×3', made of ceiling boards, with a 1¼ rim and tinned over on top and sides. This scuttle to have two hooks to hold it down.

Cornice, Rails, Brackets, Gutters, etc.—Form the cornice as shown on the plans, of clear, soft white pine, no sap. The columns may be whitewood, turned as shown, 8×8. The sweeps will be made of 3 pieces, 1¼, fastened together and moulded as will be shown. The filling over sweeps will be 1¼ square and 3½×3½ open spaces left between. These squares must be neatly formed. The cornice will be a 4" crown moulding, crown faced dentals, and a small quarter round planted under dentals. This cornice to be put up on all the different places as shown on the front elevations Each side of hood will be shingled not more than 3" to the weather. No cutting. The small pediment in front of hood will be plain, and a neat rosette planted on, at least 10" in diameter. Put in two brackets under small pediment as shown. Do all necessary boxing of timber overhead; and ceil overhead with 3" narrow beaded ceiling and brake a small moulding around in the angle. The straight filling on sides will be the same pattern as that of sweeps. The top rail at bottom will be 3×4 moulded. The bottom rail 3×3 moulded. Balusters 2×2 square and turned. The filling under front window of second story will be formed in squares about 3×3 and a small rosette planted on the cornice over show window will be as shown, with fascia crown moulding, and moulding at bottom and rosettes planted on. Make the two large brackets as shown, 8" thick, moulded on face and splayed on edges. Ceil the under side of balconies with 3" narrow beaded ceiling, ⅞ thick. Put in all necessary pieces to make complete. These two large brackets must be held in place by a long bolt running into the brick wall and nutted up tight, and have a small round iron built in wall, and bore a hole in bracket to keep it from settling down. Put up the show window as shown. The sash will be made of clear soft 2" lumber in double sliding sash, no weights, but proper fastenings to hold them up. Head lights made 2" thick and to swing on top and fasten. Form transom as shown. Form moulded sill and base to show window as shown. The under part of show window will have sash to open, with rough plate glass inserted, and hung on top and fastened when shut or open. Anything not mentioned here to finish the front complete will be shown in details, which will be furnished when needed. The floors for balconies will be boarded with hemlock boards, and have a slight cant each way to run the water off. Make and lay a striped floor on each balcony 2" strips, ⅞ thick, screwed to 1¼ bearing strips; these bearing strips to be scribed to tin work, so as to make the floor level. The strips to be ¼" apart, and paint edges before laying down. This floor to be fitted neatly on each side, so it will lie solid, and made in two sections, so it can be easily taken up. Form gutters on main eaves as shown, 6" high, and small cap on top, and line inside and give proper cant to rear.

Cresting and Finials —Furnish and put up the three finials as shown Allow for finials $3 each. Also put up cresting and allow for same $1.50 per lineal foot. This iron work to be selected by the architect.

Window Frames, Door Frames, Shutters, Blinds, etc.—All the window frames made in the usual way. For brick work jambs, 1¼ thick. Outside casings 1¼×2, back stops ⅞ and 2" sills. Make regular boxes for weights and pockets. The first story will be arranged for sub jambs, but the second story will have jambs proper width, so they will come flush with plastering. All to have proper weights, 2" pulleys, and Italian sash cord, to be fastened with bronze daisy pattern sash locks. The upper edge of top casing on these frames will be made segment, so mason can arch over. All these frames must be primed before setting, and the carpenter must set same and protect them. The cellar frames in rear will be made as usual, for single swing sash, hung and properly fastened when shut or opened. The two windows in bay on second story, one on each side, will be made box heads, so as to permit easy access to balconies. Make the rear door frame in the usual way, wide jambs, and make top of head casing segment same as windows. The frames for front doors will be shown on details when needed. Put fascias on eaves and barge boards on rear gables.

Blinds and Shutters.—All the second story windows will have outside rolling blinds, properly hung and fastened when shut or open, painted three coats at the factory. The two rear windows on the first story will have paneled shutters in pairs, properly fastened when opened and barred when closed

Back Stoop.—Put up back stoop; suit the grade to 1¼ treads. ⅛ risers, ⅞ floor, 4 × 4 post running from ground to proper height of rail, put rail on each side, with plain straight balusters, and ceiled up tight on both sides.

Ceiling in General.—The whole entire first story, including the ceiling, to be ceiled with 3" beaded yellow Georgia pine ceiling, ⅞ thick, clear face and smooth blind nailed. The closet under front stairs to be ceiled in same way. Also make partition between office and main store of same material. Put in small quarter round in angles of ceiling. Top of show window to be finished in same manner. The partition will have sash on right of door as shown. These sash will be properly fitted in frames, about 4 ft. from floor to sash, and the sash about 4 ft. high, made so they can be opened if necessary. The door in this partition will be a sash paneled door. The bottom of show window will be floored to the height of bottom of sash, and the front of same will be ceiled same as other part of store. The front of this to finish with nosing and cove finish.

First or Store Floor.—Lay the entire first floor with yellow Georgia pine, 3" wide, perfectly dry, clear face, and blind nailed in each and every nailing, driven up perfectly tight. Lay entire second story floor with narrow tongued and grooved white pine flooring, perfectly dry, well driven together, and blind nailed in each and every nailing. No loose knots. The first story 1⅛ thick, second story ⅞ thick.

Stairs, Rails, etc.—Build the front and back stairs as shown on the plans, the treads to be 1½" yellow Georgia pine strings, 1¼ white pine risers, ⅞ white pine nosing, and cove finish. House the treads and risers into the strings and wedge with glue, the upper edge of string to match base. The under side of front flight will be ceiled and the under side of back flight will be arranged for plaster. At the head of each flight there will be a 6" turned and square ash newel let in floor and made perfectly solid. Run a 3 × 4 ash moulded rail from each newel back to corner of wall. Insert on each side 2" ash neatly turned balusters, 5" from centers, bored in rail and dovetailed in floor, and driven in with glue. Nosing and cove finish around stairs. The risers and treads will be tongued and plowed together, with three blocks glued underneath on each tread. Put up on either side of both flights a 2" turned ash wall rail, with turned ends and supported on ornamental brackets, put on *close* enough to make strong. Build cellar stairs where shown, of 2" rough spruce plank, strongly put up and to have pine hand rail.

Trimmings, Stools, Bases, etc.—All the trimmings showing in the first story inside will be yellow Georgia pine. Set jambs for windows to be made proper width and tongued into sub casing, window stools made to lap on window sill, and finish with nosing and cove finish with apron. The casing will be 5" wide, with turned corner blocks at angles, these casings to be moulded in solid, as will be shown. All the work on the front which will show white pine in the natural way in finishing front will remain so. Furnish all necessary stop beads, etc., to make windows complete. The entire second stories and both hallways at bottom of stairs will be finished in white pine, clear and good. Door jambs 1¼, rabbeted casings, 5" wide, moulded in solid corner blocks at angles. Small wall moulding to miter around casings and base. Base 8" wide, moulded in solid. Furnish all windows with proper stools, aprons, etc. Stop beads complete.

Doors —The store door will be made as shown, 2" thick. Hall door as shown, 2" thick, wood panels. All other doors ordinary four paneled. All clean and dry for wood filling. All to be per number and size and thickness as marked on the various floor plans, and all to be white pine and moulded. All these doors to have ash saddles. The front and store doors to be hung with 5 × 5 imitation bronze butts, three to each door, all other doors hung with 4 × 4 imitation bronze butts, two to each door, the hall door to have a 6" lock, with night latch attachments, with bronze knob outside and bronze escutcheon with bell pull to match. Furnish and

hang a 5" gong bell in lower hall. The store door to have an improved latch handle, real bronze. All other doors to have brass faced mortise locks, except 1¼ doors. Those to have where in closets reverse bevel rim locks. Cellar door to have 6" plain rim lock All outside doors and cellar door to have extra bolts. Knobs and escutcheons for inside doors to be jet and imitation bronze mountings. Put on all necessary plaster corner beads where required.

Shelving.—The two kitchen closets will be shelved five shelves high, one side of pot closet and three sides of china closet. Shelves about 14" wide. The bed room closets will have two shelves each and hanging strips underneath. Supply these strips with wardrobe hooks. Also put up other hook strips where requested, and supply with hooks. Rubber tipped bumpers to all doors necessary.

Sink.—Furnish and fit up sink where shown, as directed, 18×30, and a No. 2 Douglas lift pump. This pump to have a 1" A caliber supply pipe, lead, connected to pump and cistern. Also connect 1½" B lead pipe for waste with trap under sink, same size, and run down to cellar and connect to drain tile, which will be furnished and set by mason. Carpenter to do all necessary woodwork for the plumber, and put up all necessary pipe boards.

Blocks, Furring, etc.—The carpenter to furnish all necessary lintels, arches, centers, and furring for mason, of every description whatever.

Sash and Glass, Closing Building, etc.—All the sash throughout, except cellar, to be 1½" thick. Cellar sash, 1¼" thick. The glass all well puttied and tinned in. All glass, except front, to be second quality double thick French sheet glass, the front, including the door and head lights, to be first quality French double thick, put in in the best manner. The building will be tightly closed up for the mason. If the sash are put in, they must be protected, and the carpenter be responsible for all the glass and make good and replace all broken ones.

Coal Bins.—Build the coal bins where shown on the plans, of 2×4 scantling and surfaced hemlock boards, with hinged door complete.

Locker.—Build the locker where shown on the plans, of 3" strips, put ¾" apart, and nailed to cleats with wrought nails and clinched, and to have door hung complete, with lock and key. This locker to be shelved as may be directed.

Hardware.—All the hardware to be of the best city manufacture.

Put headlight over back door, hung on top and properly fastened when shut or open.

Privy.—Build privy on ground where directed, 4' 6" × 5' × 7' high. Built of 4½ ceiling, planed on two sides and ceiled overhead. Put in floor, seat, and small seat, all to have covers, small sash to slide, and batten door. These covers to be hung with flaps, door to be hung and have lock and key. The roof to be shingled and have crown moulding for cornice. Put cover on that part of vault which projects out.

Scuttle in Ceiling and Ladder.—Put scuttle in ceiling in second story hall, 2' × 3', with cover complete. Make a light ladder to same, with rounds instead of steps.

Gas Pipes.—Put in a system of gas pipe outlets where marked on the plans. Side lights 5 6 from floor. Comply with the rules of the gas light company. The company will connect from the street. These pipes to be tested and made perfectly tight.

MASON'S SPECIFICATIONS.

Stone Work.—The stone wall to be 16" thick, the height of 7' in the clear, of cement bottom, wall laid up with good sized quarry stone, laid bouding. After floor beams are laid they will be filled in between with stone and leveled to the top to receive brickwork. This wall to have footing course of solid grouting of gravel and cement, to project at least 3" either side of wall, and to be 4" thick. The same kind of footing course under brick piers in cellar. Stone wall laid up with cement and clean, sharp sand mortar, one of cement and three of sand; flush point the entire inside and out.

Stone Sills.—Furnish bluestone sills for all the side and rear windows. Selected as smooth as possible. Also, same kind of sills for cellar windows. The two doors in front will have brownstone sills. 8" thick, and wash cut in. Also furnish and set 8" water table under show window, with 2×2' wash cut on these sills, and water table, to be set level with top of floor. This to be fine tooled work. The back door sill will be bluestone selected.

Areas.—Build two areas to cellar windows on rear, about 2' deep, surrounded with bluestone flags and brick bottom.

Cistern.—Build cistern where directed, 10' deep and 8' in diameter, all in the clear. Built of imperfect shape, hard burnt brick, laid flat in cement mortar, domed over on top, and form neck and cover with bluestone cap. Cement the entire inside with Rosendale cement and warrant perfectly water-tight. Connect this cistern with leaders with 4" drain tile joints, well cemented together, and put down at least 2' 6" deep in the ground.

Cesspool.—Build cesspool where directed, 8'×8' in the clear, about 50' from the nearest point of building. This cesspool to be built same as cistern, water-tight. Run a 3" drain tile from inside of cellar wall to same, made perfectly tight. Also run a 4" drain tile from cesspool about 20' on the low side, and turn down in cesspool. This pipe is intended to carry off the water and soak away. Both of these pipes to be at least 2' 6' deep.

Brick Piers for Back Stoop.—Build two 8×8 brick piers for back stoop, with foundations 2' 6" deep.

Privy Vault.—Build privy vault where directed, 4 ft. deep, made of stone and laid up with mortar, and cemented bottom, leveled off on top 1 ft. above ground. This to be 3' 10" × 6' 6" in the clear.

Brick Piers in Cellar.—Build the brick piers in cellar where indicated on plan, 12 × 12", built of hard burnt Jersey brick, laid in cement mortar.

Cementing.—Cement the whole entire cellar bottom with Rosendale cement. One part cement and two parts of screened gravel, made 3" thick and smoothed off on top, and have a slight fall to cellar drain. Make a depression about 1" deep next to cellar wall all around.

Brick Work.—The building to be built of hard burnt Jersey brick, except front of the first story to the top of second story. Beams will be 12" thick, balance 8" thick. These walls laid up with sharp sand and lime mortar and a little cement. Headers every sixth course. The joints laid as close as possible, and neatly struck both sides. Build chimney flues where shown, and struck joints. Top these chimneys to the height of roof peak, and capped with bluestone caps. The windows coming in brick walls will have arches turned over with two rowlocks. Mason will assist carpenter in bedding plate. The front will be laid with pressed brick, laid close in red mortar and well joined and bonded to side walls. All the brick which is covered in front may be Jerseys. Turn arch over second story bay, 2 ft. spring, in the strongest manner. Leave dry joint in every tenth course for carpenter to nail furring to. The front to be cleaned down with acid. The rear gable will be bricked up to peak.

Iron.—The mason will furnish all necessary anchors to tie walls to floor beams; and also all necessary iron work to tie front walls to sides, furnish and put in place one iron girder to support second story wall in front. Also furnish and set two 5" iron columns, plain, with large cap and shoe. Particular care must be taken in the foundation under these columns. The shoe to be set in cement, so as to have an equal bearing on every point. The iron beam will be bolted to a wood beam on each side with ½" bolts.

Plastering.—The entire second story, including closets, hallways, and down stairways, back and front halls and underneath back stairs, including each side thereof, to be lathed and plastered three coat work scratch brown, and hard finished. The mortar, made of the best plastering lime and sharp screened sand scratch coat, to have plenty of long hair in, the hard finish to be gauged high. Use white sand for hard finish.

Coal Chute.—Build coal chute where shown on the plans, with round hole cut in flag walk, with iron cover This chute to be covered over on top with flags, and build up sides with brick wall. Also make bottom of brick, so the coal will slide easy, without any obstruction whatsoever.

PAINTER'S SPECIFICATIONS.

The whole exterior of wood and tin work to be painted two good coats of English white lead and linseed oil, of such colors as may be selected. The priming to be done immediately after the work is put up. Putty up all nail holes after priming is done. Shellac all sap, knots, etc., before priming. All tin work painted two coats of Prince's metallic paint, including leaders. The cresting and finials to be painted two coats of such colors as may be selected, with gilded tips and points.

The store part to be finished in two coats of white shellac. The closet under stairs to have one coat of raw linseed oil. All door saddles oiled. The bottoms and tops of outside doors and all sash to be painted. The second story, including stairs, hallways, stair rails, first story balls, and closets, to have Wheeler's wood filler, and well picked out. Then finish with two coats of hard oil finish. The stair rails will be rubbed down, including balusters and newels. All cracks and nail holes to be well puttied up. Putty to match color of wood. Also paint privy and shutters on first story same as other wood work.

The costs are—

Mason work, complete	$1,900
Carpenter work, painting, tinning, etc..	1,900
	$3,800

FULL plans, specifications, and details, ready for the builder, of any of the houses illustrated in this publication, may be had on moderate terms at this office. Special plans and specifications for the erection of buildings of all grades are also supplied by us. Munn & Co., architects, 361 Broadway, New York.

Plans for the alteration and enlargement or improvement of buildings are also supplied.

A ONE STORY SOUTHERN RESIDENCE.

We illustrate herewith a design for a comfortable one story Southern residence. The building has a front of 42 feet, side 84 feet, not including the front veranda. The dimensions of the rooms are ample, as will be seen from the plans. Their height is 13 feet in the clear.

Materials.—Foundation, brick. First story, to the top of the windows, clapboards, the balance shingles. Roof, shingles. Cost, $5,000. No cellar. The airiness and convenience of this dwelling will be readily understood by an examination of the floor plan.

Cost of Brick and Brickwork.

The cost of brickwork depends on the cost of the bricks and delivering same at the building, the wages of brick masons and helpers, the cost of mortar, and the use of tools, machinery, and scaffolding.

CONSTANTS FOR MORTAR PER M. BRICK.

M = 0·50 cubic feet (20 bricks per foot).
Sand = 0·35 cubic yard.
Cement = 1·46 barrels of 300 pounds.
Or lime = 1·75 barrels.

Labor per M., including tools, etc., is about seven-eighths of masons' and helpers' wages per day for ordinary city buildings, but for government buildings it is about one and one-fourth times the same wages. This difference is principally because city houses generally have long party walls, with very few openings, and the frames for doors and windows are set in place while the brickwork is being built, whereas, in government work, all four sides of the building are fronts, and there are a great many windows and openings in the walls, which, of course, take more time to measure and build to than if the walls were plain, and the frames of doors and windows are not put in the building until the masonry is completed and the roof is on; besides, as a general rule, the work is better and stronger. Some of the brick walls for the building now being erected at Rochester, N. Y., had to be taken down on account of an extension having to be made, when it was found necessary to drill and split the brickwork with wedges in order to get the walls down, the cement mortar very often being stronger than the brick.

A brick mason with helper should lay in common house walls 1,200 to 1,500 bricks per day of ten hours. In government work, the average is from 800 to 1,000 for common brick, and in pressed and moulded brick from 150 to 300 per day.

COST OF COMMON BRICK PER M. DELIVERED.

1884. Columbus, O.	$6 00	1886. Pittsburg, Pa.	$8 00
1881. Baltimore, Md.	8 00	1888. Des Moines, Ia.	10 00
1885. Jackson, Miss	4 00	1885. Dallas, Tex.	8 50
1882. Toledo, O.	8 00	1886. Jefferson City, Mo.	8 00
1883. Denver, Col.	7 50	1886. Rochester, N. Y.	8 00
1886. San Francisco, Cal.	8 50	1881. Rochester, N. Y.	7 00

COST OF BRICKWORK PER M. LAID COMPLETE.

1884. Poughkeepsie, N. Y.	$21 50	1885. Fort Wayne, Ind.	$16 00
1885. Dallas, Tex.	16 00	1884. Rochester, N. Y.	14 00
1885. Brooklyn, N. Y.	15 35	1886. Rochester, N. Y.	15 50
1885. Pittsburg, Pa.	14 00	1886. Des Moines, Ia.	17 00

PRESSED BRICK.

Bricks alone, delivered, cost from $20 to $30 per M. Selected red, about $15 to $18 per M.

COST PER M., PRESSED BRICK, LAID COMPLETE.

1884. Poughkeepsie, N. Y.	$30 00	1885. Brooklyn, N. Y	$40 00
1885. Jackson, Tenn	65 00	1886. San Francisco, Cal.	45 00

Moulded bricks cost from $40 per M. up to $120, depending upon the profiles. The average for the profiles ordinarily used is about $70, and the cost of laying averages about $30 per M.

Enameled bricks, on edge, cost about $68 per M. Enameled bricks, on edge and end, cost about $75 per M. Enameled bricks, on edge and flat, cost about $100 per M., and the cost of laying them is from $30 to $35 per M.

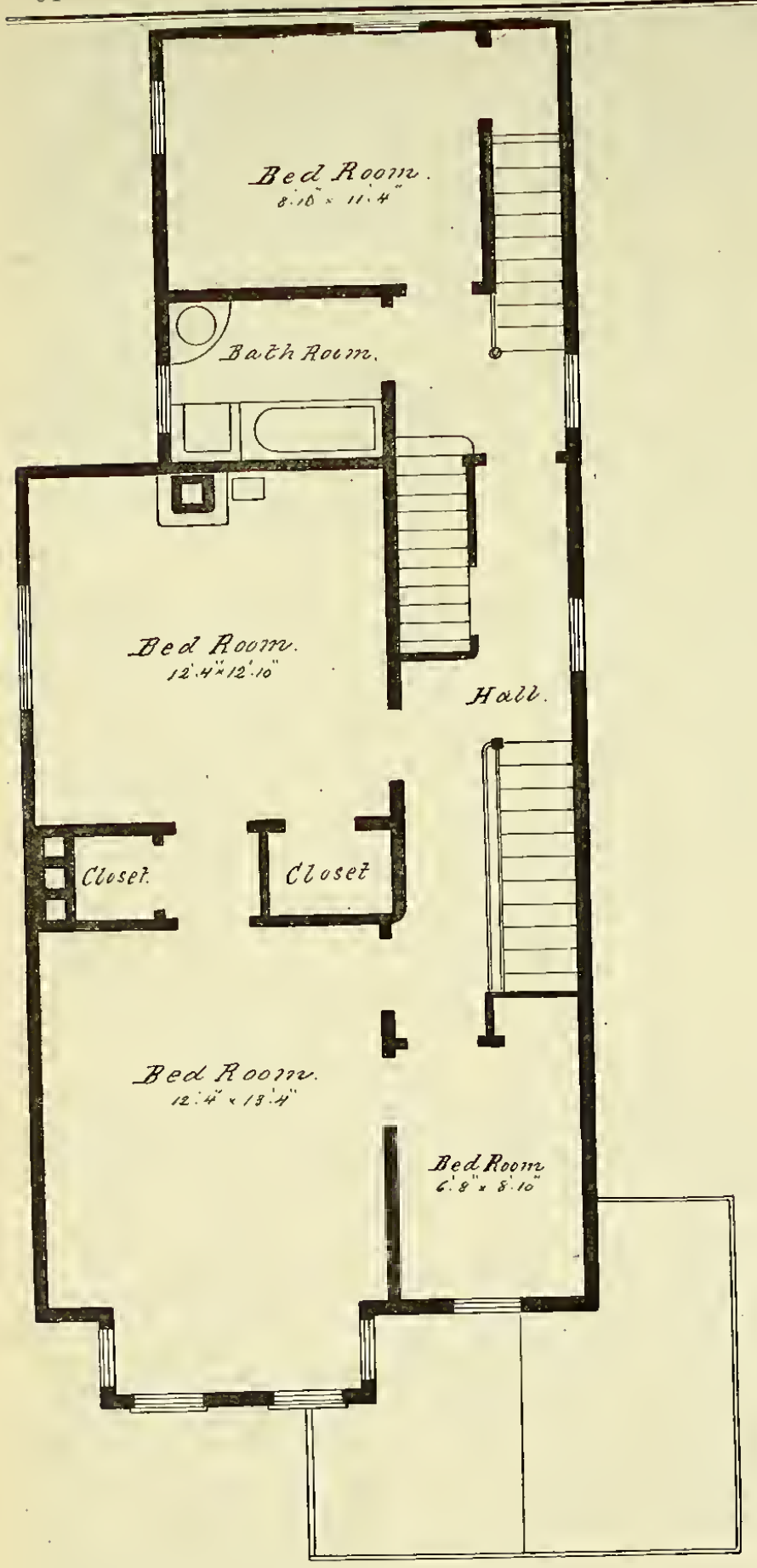
The price of terra-cotta depends upon the pattern or design, the average cost per square foot of exposed surface laid in wall complete being, for stock patterns, about $1.50, and for special designs from $2 to $2.50.—*Jas. E. Blackwell, in Amer. Architect.*

DWELLING FOR A NARROW LOT.

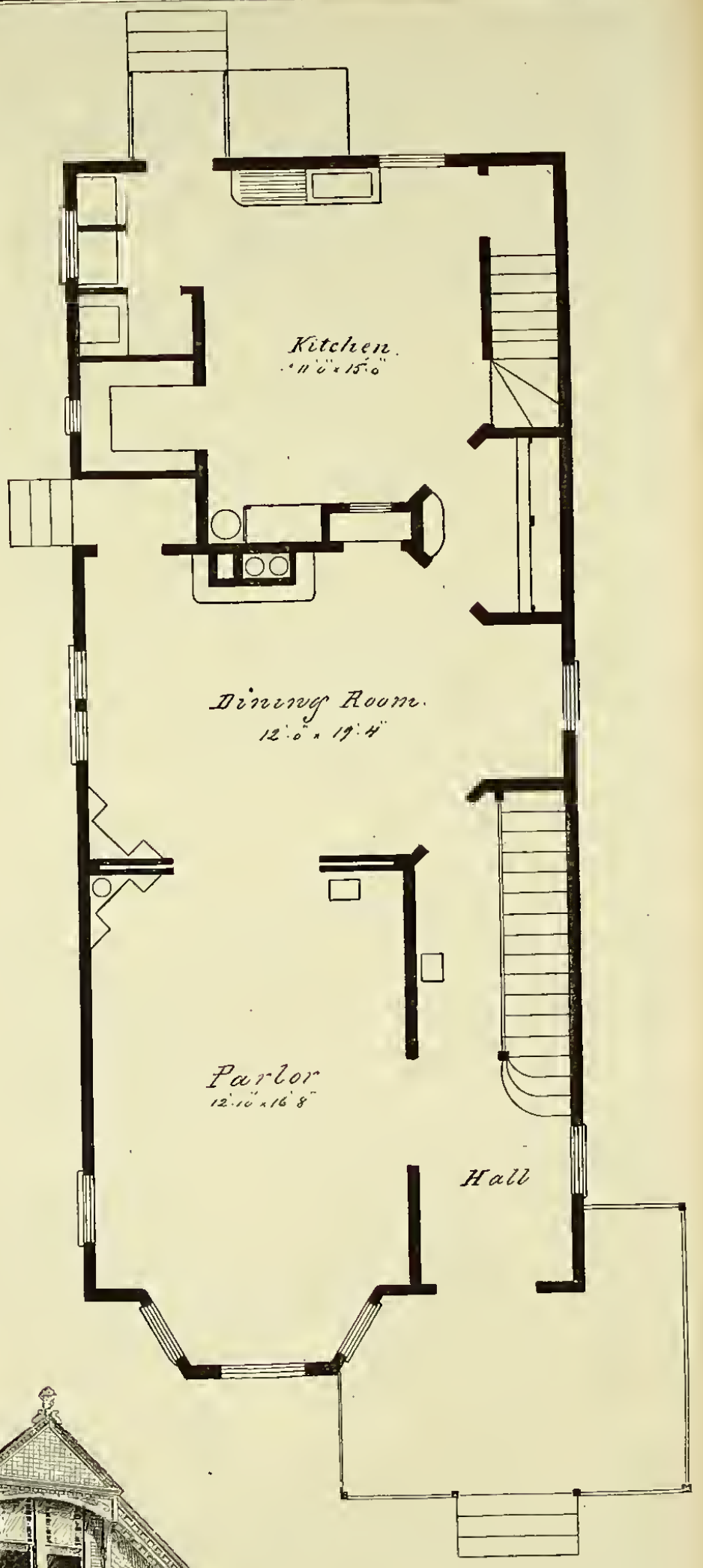
The two story attic house shown in our engraving has been erected in the vicinity of New York, at a cost of thirty-five hundred dollars. It has a good cellar, is provided with furnace and all the modern conveniences. Presents a handsome appearance and gives much satisfaction. In some localities where materials are cheaper the house could be built for less than the sum above mentioned.

A HOUSE FOR $2,800.

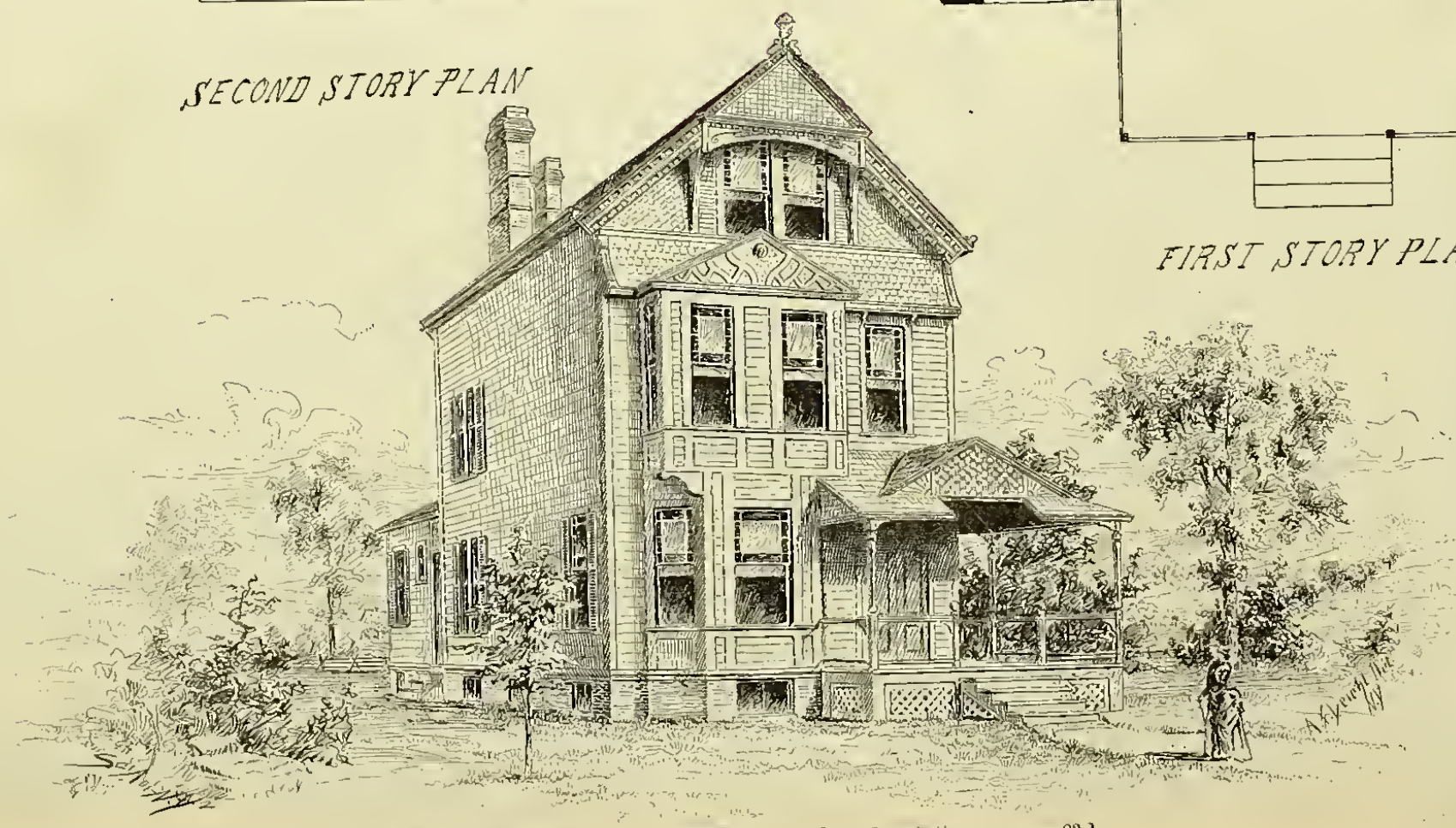
Our illustration shows a compact two story and attic dwelling erected at Arlington, N. J., at a cost, without plumbing of $2,800. It is 33 ft. in length by 28 ft. in width. Has a good cellar and attic. The exterior presents an agreeable variety in its details and shows to good advantage.



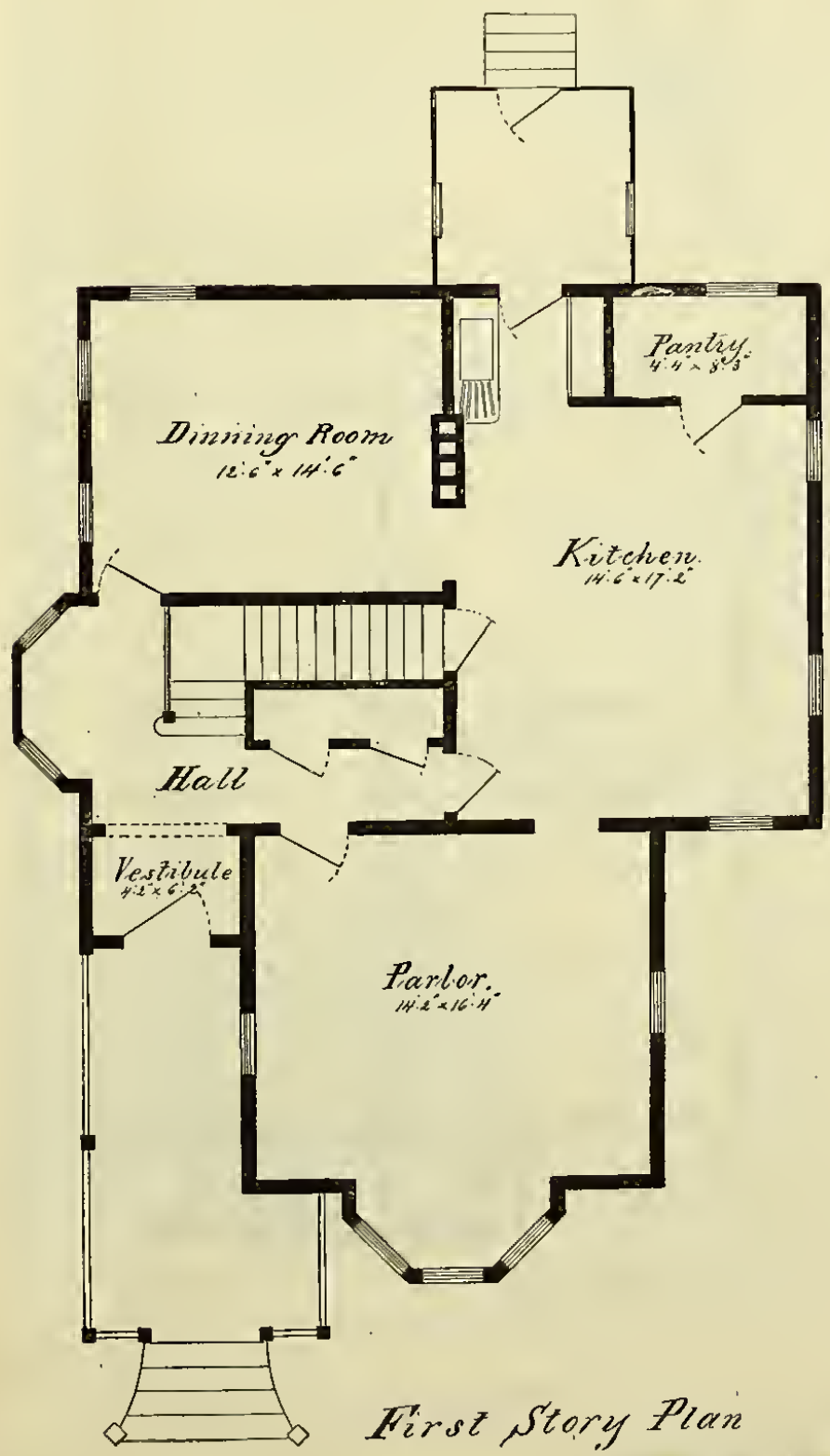
SECOND STORY PLAN



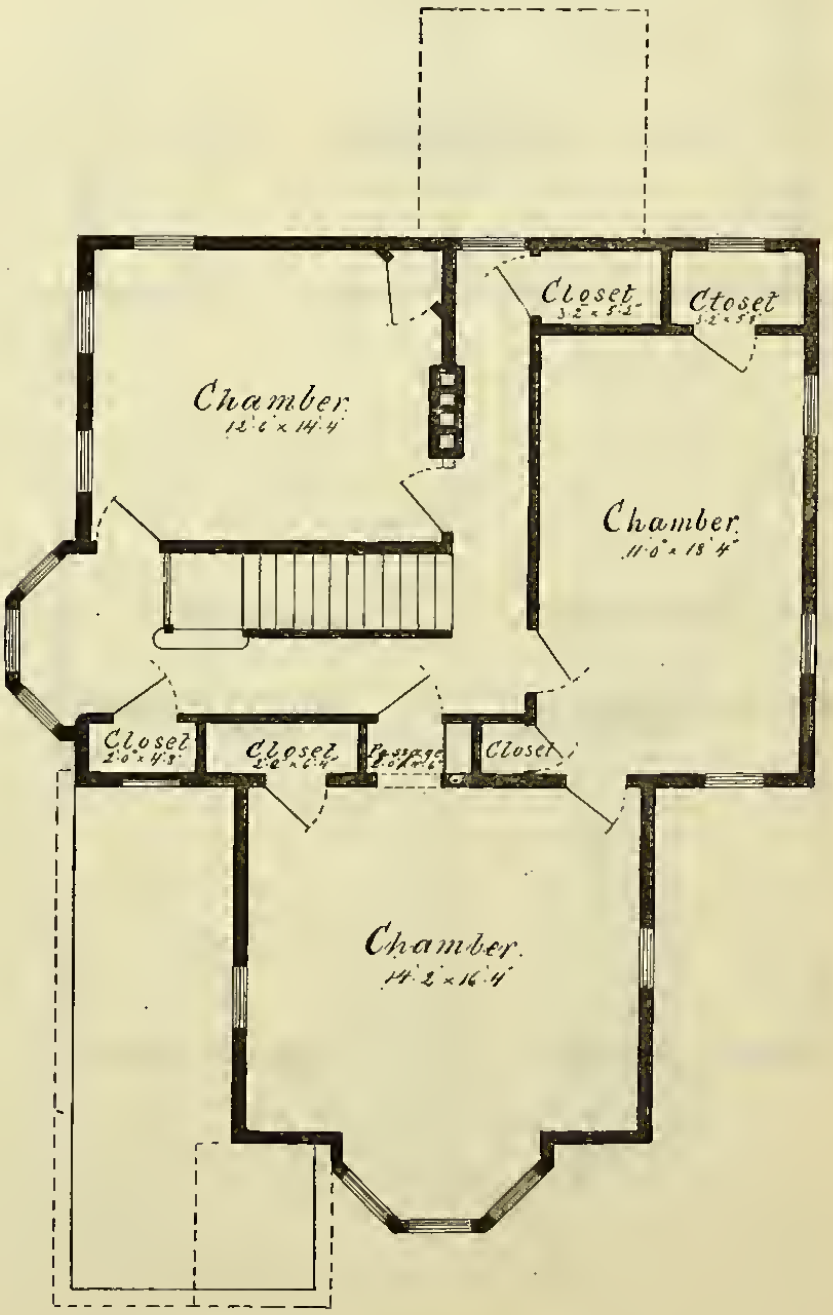
FIRST STORY PLAN.



DWELLING FOR A NARROW LOT.—[For description see page 83.]



First Story Plan

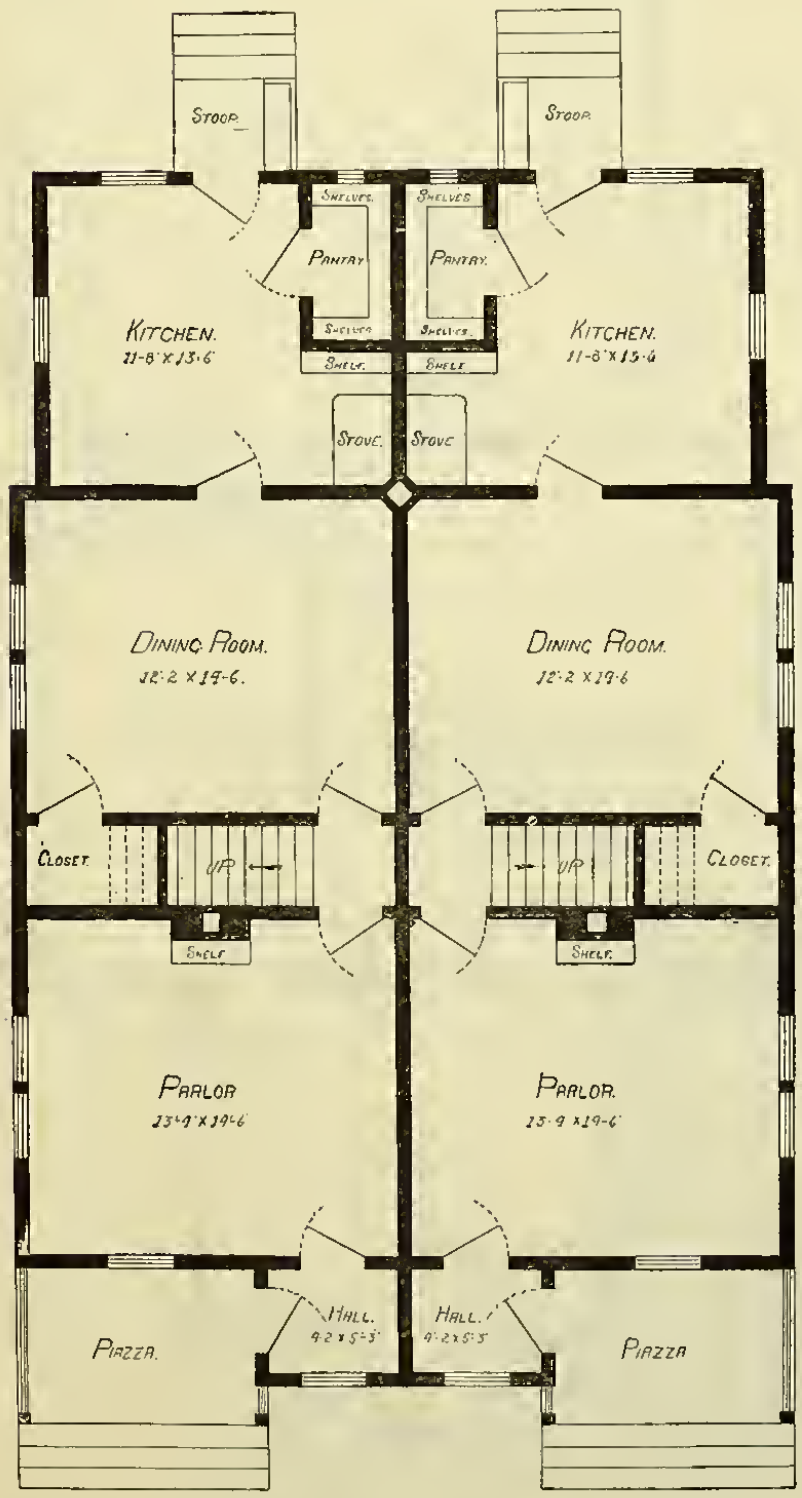


Second Story Plan

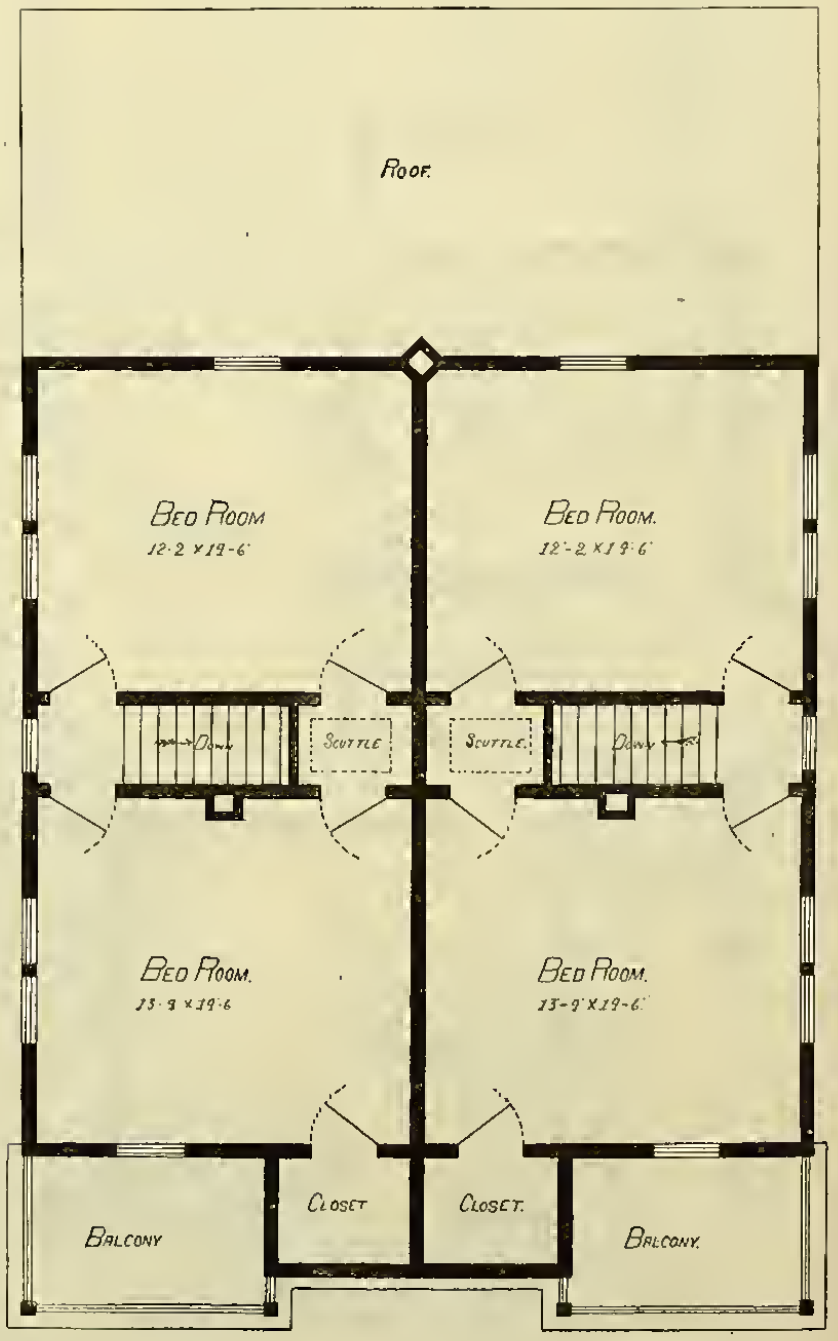
A HOUSE FOR $2,800.—[For description see page 88.]

A DOUBLE HOUSE OF MODERATE COST.

This double dwelling was designed for erection in Iowa, and the builder's estimate for that locality was $1,800. It is 28 ft. wide over all and 45 ft long, contains ten rooms, five for each tenant, all conveniently arranged. The piazza entrances are entirely separated, provided with vestibule doors. There is ample closet room. Altogether the plan gives much satisfaction, while the exterior is pleasing.



First Floor Plan.



Second Floor Plan.

A DOUBLE HOUSE OF MODERATE COST

UNITED STATES MAIL CHUTES FOR INTERIORS OF BUILDINGS.

The government provides, in all large cities, most excellent facilities for collecting letters for the mails, the collectors making tours of the streets for this purpose from two or three to a dozen times a day, and taking up the letters deposited in the lamp post boxes, or receptacles placed in the most convenient public places, often as frequently as every hour. Business men are thus enabled to dispatch their correspondence with a promptness almost as marked as if they had special messengers and chartered express trains constantly ready for service.

Everything which in any way contributes to quick service needs only to be known to be duly appreciated and adopted, a fact which is now becoming apparent in regard to the Cutler mailing system, or patented mail chute, at present acknowledged to be the proper supplement and accompaniment of the passenger elevator in all high commercial or office buildings. The illustration herewith shows the working and explains the utility of the mail chute. After obtaining the consent of the postmaster, a United States mail box is located in the lower corridor of a building, and to it is joined a conductor made of metal and plate glass, handsomely finished, which runs up through the building, and is provided with openings in each story. Here the occupants deposit their mail, instead of having to descend to the street for the purpose, and so deliver it directly into the United States mail box.

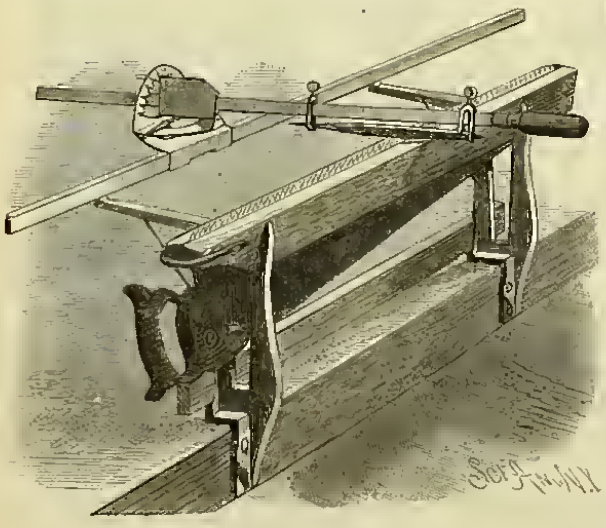
The chute in its present improved form is made in ingeniously constructed sections about four feet long, so arranged as to be readily taken out in case of accident. A simple but efficient means of rendering the point of passing through each floor waterproof is employed, and in buildings whose height makes it necessary an elastic bottom is placed in the mail box to break the fall of heavy matter. Adjustment is made in each story to permit expansion and contraction to take place without affecting the joints between the plates of glass and metal, and the mail openings are protected from improper use or crowding large packages into the tube by a balanced guard of brass with the front edge milled, any effort to force this resulting in closing the opening.

This improvement is now in use in nineteen of the largest cities of the country, and in most of the finest office buildings which have been constructed, so that a structure intended to be occupied for office purposes cannot be said to be completely equipped with all the modern improvements without it. Further information relative to this system, which is fully covered by United States patents, will be cheerfully furnished by the sole makers, The Cutler Manufacturing Co., Rochester, N. Y.

THE CUTLER MAILING CHUTE FOR POSTING LETTERS.

AN IMPROVED SAW FILING MACHINE.

An efficient and easily worked device by which saw teeth may be filed to an accurate and uniform bevel and pitch is shown in the accompanying illustration, and has been patented by Mr. Hamilton Sherman, of Waverly, Pa. It consists of a file frame guide with a base plate sliding on a guide bar. A head piece is pivoted to the base plate, so as to be movable in horizontal plane, and has a guide frame for the file-holding



SHERMAN'S SAW FILER.

frame bar to slide through, pivoted to the head piece, to swing to either side of a vertical line, there being catches for holding the file to the required sidewise, slanting, and axial positions. The saw is firmly held in the clamp of the machine frame, which is so made as to be easily taken apart and put together, and the file frame, in which the file has been set, is adjusted at the required angle to give the proper bevel to the saw teeth, and also to set the file axially, and the file is then held relatively in these same positions to the saw throughout the work of filing. Accuracy and uniformity are thus secured, and the operation can be most expeditiously performed.

Drawing and Engineering Instruments.

With the rapidly growing engineering and manufacturing interests of this country, there naturally comes an increasing demand for fine engineering instruments and supplies. In years past, the bulk of fine drawing and engineering instruments came from Europe, but now such instruments are made in this country in large quantities, and of a quality equaling, if not surpassing, anything produced in other countries.

We have before us a very complete and finely illustrated catalogue of instruments manufactured and sold by Messrs. Keuffel & Esser, of this city. In this catalogue is described every imaginable article for the use of the draughtsman, architect, or civil engineer. All of the recent appliances are illustrated, many of them for the first time.

This firm have an extensive factory in Hoboken, N. J., a store and wareroom at 127 Fulton Street and 42 Ann Street, New York City, and they have recently established a house in Berlin.

We are pleased to note the rapid growth of this industry, not only on account of its importance to this city, but also on account of being a sort of index to the prosperity of manufacturing and engineering interests generally.

Tests of Portland Cement.

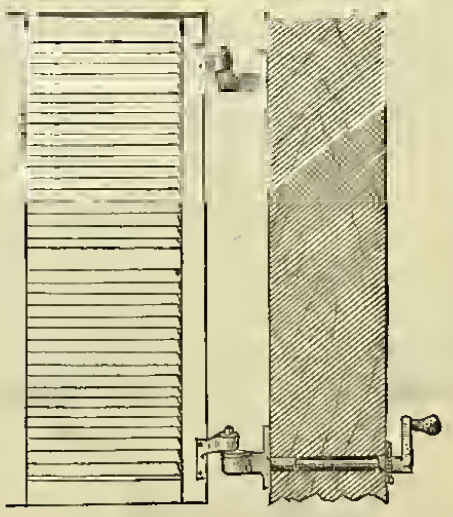
In obtaining reliable results, certain tests are necessary in the use of Portland cement. Weight per bushel is not always to be relied on, unless the cement is fed through a standard hopper into a measure of standard size. One authority, Mr. D. L. Collins, gives rules for this weighing, and a drawing of a hopper. Fine grinding is of more importance, and it makes great difference to the weight, as may be observed by passing the best cement freshly ground through an eighty mesh sieve, and leaving certain percentages of residue. All cement increases in bulk and weighs less with age. Fineness of grinding is one of the safest tests. For engineering works the per cent. residue left should be under ten through a sieve with 2,500 meshes, and for special work the same residue through a sieve of 6,400 meshes. Speaking of the water test, Mr. Collins says it is one of the safest guards as to the soundness of cement; and recommends that thin cakes should be made up and placed upon pieces of glass or other non-absorbent material, and then, when thoroughly set, one cake should be immersed in water, the other being kept in the air. Before immersion, the cakes may sometimes require twenty-four hours to become set. If after this the cakes show cracks in the outer edge, the cement should not be passed unless it can be proved that the defect is due only to freshness of grinding, and can, therefore, be thoroughly remedied by air slaking. A glass test tube filled with gauged cement is a good test. If the tube cracks in two or three days, the cement is good. If the expansion bursts the glass to pieces, it is inferior. Many clerks of works use the test tube, and on all works where good cement is required it ought to be tested in this manner.—*Building News.*

Whooping Cough a Dangerous Disease.

The attorney-general of the State of Michigan has recently handed the secretary of the State Board of Health a decision in which whooping cough is classed among those diseases which are "dangerous to the public health," and which are required by the statutes of Michigan to be reported by the attending physicians to the health officer or clerk of the local board of health. The evidence which was placed before the attorney general, and on which he based his decision, was that while small-pox was the cause assigned to the average number of 53 deaths reported each year to the secretary of state for ten years, ending with 1882, whooping cough was reported to have averaged 156 deaths per year during the same decade. In England whooping cough comes next to scarlet fever in causing deaths, and it is a notorious enemy of infant life. The inclusion of this disease among those which must be recognized by boards of health as dangerous to the public health is a step in advance. We see so many nowadays that the steps sound like the passing of a platoon of infantry, and the progress is very gratifying. Now, when boards of health and health commissioners make recognition of measles as a contagious cause of needless deaths, the pegs can be set up a notch higher to denote sanitary advancement.—*Sanitary News.*

AN IMPROVED DEVICE FOR WORKING WINDOW SHUTTERS.

A simple mechanical device by which a window shutter can be opened or closed, or fixed in any desired position, from the inside of a room, without opening the window, is represented in the accompanying illustration. The fixture takes the place of the lower hinge of the shutter, and has a rod which passes through the side of the window frame into the room, to which is attached a small handle. On the outer end of the rod is a worm or screw, which meshes into a worm wheel working horizontally on a small bracket, no larger than an ordinary hinge, this worm wheel carrying a shutter supporting arm, the working parts being incased so as not to be affected by rust, snow, ice, or dust. The handles and escutcheons are made of imitation bronze, brass, bronze, or nickel plate, and the knobs of rosewood, the handle being all that shows on the inside of the house. When it is desired to open or close the blinds, it is only necessary to turn the handle, thereby opening, closing, bowing, or fixing the shutters in any desired position, without raising the windows, screens, or curtains, and in a way so simple that any child can operate it. The pantentee and



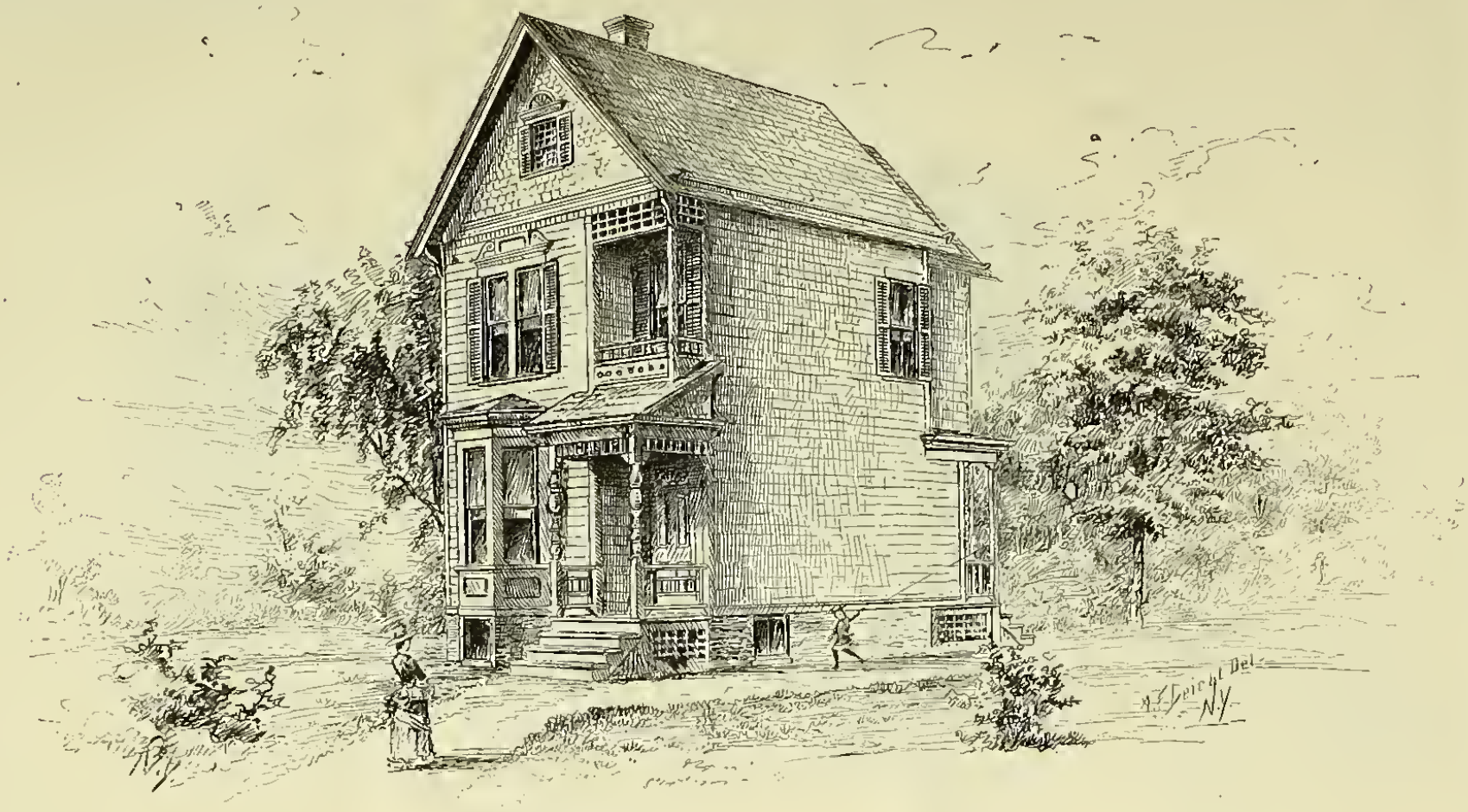
MALLORY'S SHUTTER WORKER.

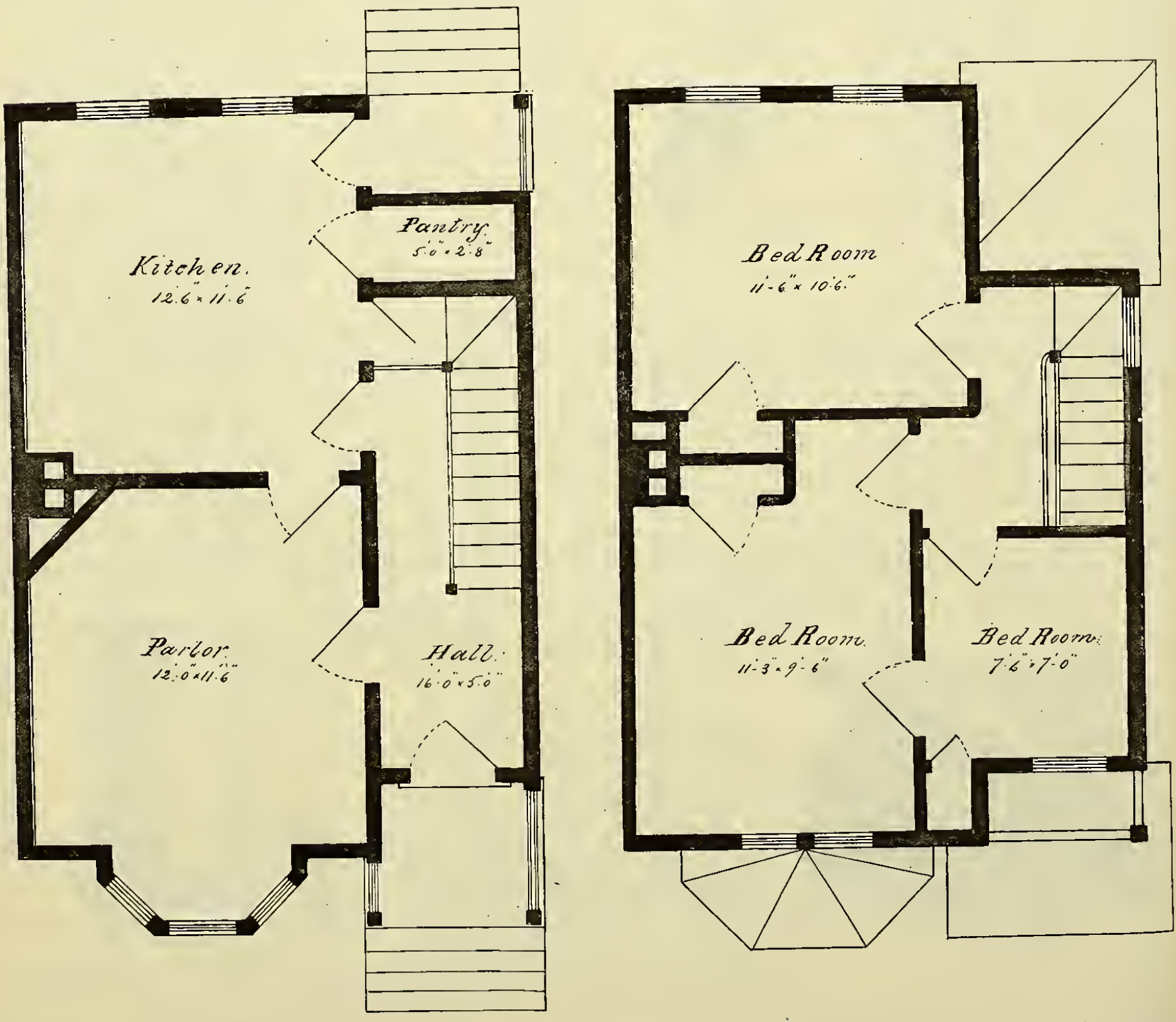
manufacturer of this improved device is Mr. Frank B. Mallory of Flemington, N. J., and No. 60 Liberty Street, New York.

It is now an imperial regulation in Brazil that persons who die from yellow fever shall be cremated, the state bearing the whole expense. This decree might be extended judiciously to all contagious diseases.

A $1,250 HOME.

Our engraving shows a perspective of a neat little two-story attic house, designed by E. M. Van Duzer, architect, Newark, N. J., which can be erected here about for $1,250, and for less money where lumber is cheaper. The arrangement of rooms is convenient.



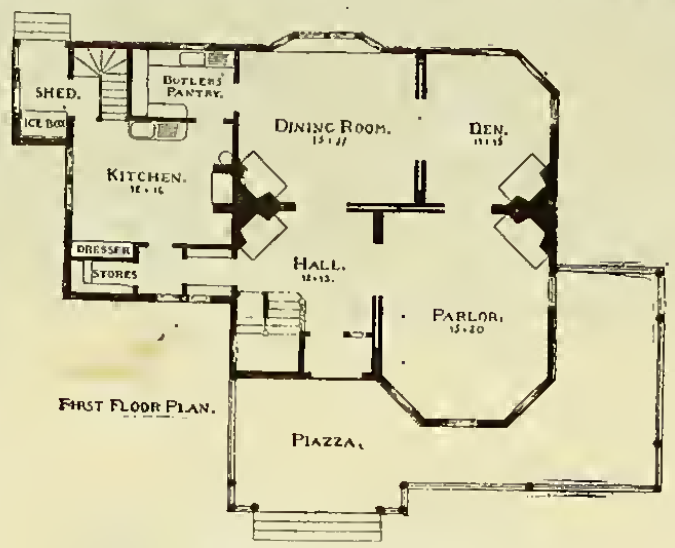


FIRST FLOOR. SECOND FLOOR.

A TWELVE HUNDRED AND FIFTY DOLLAR HOME.

A HOUSE AT FLUSHING, N. Y.

We give a drawiug of a comfortable and substantial dwelling at Flushing, N. Y., for which we are indebted to *Building*. William A. Bates, architect, New York. We give a floor plan, from which the general arrangement will be understood. Constructed and finished in satisfactory manner, we estimate the cost at about eight thousand dollars.



A HOUSE AT FLUSHING, N. Y.

Painting Brick and Stone Buildings.

To prevent the disintegration of exterior brick or stone surfaces, caused by moisture of tbe atmosphere and change of temperature, paint should be used to cover the surface. Particularly in our Western cities do we find the stone gradually crumbling away, the same action taking place with the hrick. The process of decay is certainly slow, but it is sure. How often do we see magnificent stone or hrick edifices gradually scaling and crumbling down, when by the application of a coat of paint the action could be prevented for years.

The great object is how and what to paint these surfaces with. In the first place, it is useless to ruin the outside appearance hy an application of cheap trash which can be of no material benefit so far as preservation is concerned. It must he borne in mind that paints are mainly durable, and make the surfaces that tbey cover durable, because of the water proof quality of the oil out of which they are mixed.

The natural pigments—called ochers or earth paints—do not in any degree act upon the oil; while others, such as white lead and the chromates of lead, do affect the oil chemically, and impair in a measure its tenacity and water proof quality. For these reasons it follows that the natural pigments are not only the most economical, but also the most durable for painting brick or stone houses.

It has been demonstrated that the most durable paint for brick or stone houses is finely ground French ocher, mixed in proportionate quantities with white zinc. The color produced is a soft shade of buff, most pleasant to the eye and permanent to the last degree, both in color and material.

Venetian red, an artificial ocher or red oxide of iron, is in common use, but it does not hold oil like ocher, and makes a coating far less water proof. It is a seemingly durable paint, because the stain which it imparts to a porous surface remains long after the oil has washed away. It cannot he used with zinc, because of the unsuitable color which it produces, and because this pigment (Venetian red) when tinted with wbite becomes highly fugitive in color.

The condition of the wall is also very important in painting brick or stone surfaces. The work should be done in warm, dry weather, when the moisture which the hricks or stone absorb during tbe winter and spring seasons has dried out, otherwise the paint will not be apt to adhere tenaciously, but will scale or peel off. The joints require constant looking after in the coping. These should be made absolutely impervious to water hy the application of soft putty in a mass both on the top and the edges, and when this hardens to the point of cracking, it should be renewed. Mortar and cement for such purposes are useless, for no matter how water proof the surface may he, if the water be allowed to percolate through the joints, the integrity of the wall will be destroyed.

The first coating of paint for brick or stone should be mixed very thin, more as an oil stain than as a paint, to allow the hrick to absorb all that is possible. By being thin, moreover, the paint readily runs into cavities tbat thicker material would not penetrate. The second coat can he used heavier in body. Then by the application of one coat every few years a budding would last indefinitely, and the owner would feel that his building was proof against the atmospheric changes. —*T., in Master Mechanic.*

Frosted Glass.

In building, an artistic use is made of a new glass invented by Mr. Bay, of Paris, and called frosted glass (*verre givree*). It reproduces the pretty patterns that frost produces upon window panes, and that have been called ice flowers. Mr. E. Boulanger, the architect, has brought this product to the attention of the Central Society of Architects. The process of making this glass is very simple. It consists in coating the surface of the glass, which has previously been ground with sand, with a sort of varnish tbat enters the cavities produced hy the sand. The panes of glass thus coated are then put into a stove, or, in summer, are simply exposed to the sun.. Under the influence of the heat, the coating dries and contracts, and breaks up into little scales that remove small particles from the surface of the glass.

The roughness is removed at tbe spot where each scale cracked off, and the effect produced is that of crystallization. As these different crystallizations or fractures take place in every direction, they produce, as a whole, an effect exactly resembling that produced by frost upon a window pane.

The pattern thus formed may he very small if the layer of varnish is thin, and the crystallizations are so much the larger, within certain limits, in proportion as the coatings are more numerous.

As many as six coats may be applied, and at this point the glass is reduced a half in thickness if the operation has been performed upon simple glass.

This same process can likewise be applied to colored glass. The coating, on drying, removes the colored enamel, which is of uniform thickness, and the frosted glass produced exhibits half tint colorations of a very pretty effect. The glass thus frosted, while it allows the light to enter, does not permit of anytbing being seen through it.

Upon gilding or silvering the frosted glass on the opposite side, we obtain tbe appearance of enamels of all colors, according to the colored glass employed. Under such circumstances, this glass can be used in the decoration of ceilings, cornices, friezes, window frames, mirror frames, etc. By the same process, the effect of crystallization can be obtained upon lamp globes.—*Le Genie Civil.*

Action of Frost on Cements.

Some experiments have lately been made at Schandau on the action of frost on hydraulic mortars and cements when these materials are mixed with water containing different percentages of salt. In making the experiments a series of stone cubes of about 2·4 in. edge were united with cement, which in one case was mixed with pure water and in other cases witb water containing from 2 to 8 per cent. of salt. While the cement was still fresh, tbese blocks were placed in the open air, and exposed for a period of twenty-one days to a temperature varying from 20 deg. to 32 deg. Fahr., after wbich they were kept for a further period of seven days in a warm room. At the end of this time the joints were tested, with the result that the cement mixed with pure water was completely disintegrated, having no holding power. The cement mixed with water containing two per cent. of salt was somewhat hetter, though the results obtained with it could hardly be considered satisfactory, while that mixed with the eight per cent. solution was uninjured by the exposure.

Oil of Bay for Flies.

The bay tree, which the French term *le laurier des poetes*, and its product, the oil of bay, or *huile de laurier*, have been recently mentioned in some of our foreign exchanges as proving an excellent remedy for the nuisance caused hy flies during the hot months of the year. We are informed, says the *Monthly Magazine*, that this oil is already extensively used in Switzerland hy butchers, to keep their shops free from flies, and that after a coat of bay oil has been applied to the walls, none of these troublesome pests will come near the place. For many years past this same *huile de laurier* has been used in the south of France for preserving gilt frames, chandeliers, etc., from becoming spotted and soiled by insects. No fly will alight, it is said, on a gilt surface thus treated, and rooms in which such an application has been made to the frames of pictures are soon found to be quite devoid of flies.

A HOUSE AT FLUSHING, N. Y.

THE COURT HOUSE AND POST OFFICE AT SAN ANTONIO, TEXAS.

We are indebted to the *American Architect* for our view of the edifice. It is an imposing and substantial structure.

Decorative Novelties.

Among new fireplace facings may be mentioned an artificial lapis-lazuli of great beauty in its depth and variety of shades of blue; this material is set either in small oblongs in brick fashion or broken in pieces and set like mosaic; in either way the effect is rich and pleasing. Another new facing set in mosaic is mother-of-pearl, giving out a hundred lusters of varying radiance and color. Another facing in the richest shades of brown and yellow is shown in tortoise-shell effect tiles set brick fashion. Among the richest colorings in these same small tiles is what is called bronze olive, which harmonizes delightfully with birch wood of natural finish, mahogany, sycamore, and antique oak. A lovely dining room mantel of this latter wood shows the new fireplace, called the hob fireplace, set with shaded creamy yellow tiles of a square shape. On either side of the facing, rising from the hearth, is a square faced with tiles and topped by polished brass about twelve inches high and square, on which the teapot may be set to keep the tea warm. Above the fireplace opening is a fireplace or mantel closet set midway between the shelf and the top of the opening. This closet is lined with polished brass, and shows locked receptacles, one at each end, having doors set with opalescent jewels, the central portion being open. In these closets some of the dishes of a five o'clock tea may be placed to keep warm. Hob fireplaces are not confined to the dining room, but are often attached to a boudoir or drawing-room mantel. A charming example of the latter is of wood finished to an antique ivory effect, the design in old colonial style. In this case the facing is composed of square creamy yellow shaded tiles and the under shelf closet lined with polished wood finished in dead dull gold; the locked receptacles at either end show doors set with heavy beveled plate glass. A pleasing feature of the first-mentioned antique oak mantel is the shelf arrangement, there being two somewhat short shelves, the space between being divided in panels, each panel set with a heavy beveled mirror. Above the top shelf the chimney breast is fronted by paneling in oak, surmounted by a handsomely carved frieze. Something new and effective is the beaded grate opening, the hood composed of ornate brass work set with opalescent or else ruby jewels, or with oblongs of beveled glass. Some of the new fire dogs show animal subjects in polished brass, as a pair of lions, winged griffins, a dog and a cat, a pair of dragons, etc.

Among some mantel ornaments and furnishings may be mentioned a pretty clock, vases and candlesticks in a soft ivory finished ware decorated by paintings of flowers and birds in soft pinks, gold greens, blues and yellows, the set being suited for a boudoir mantel. An attractive ornament for the antique oak mantel is a cast of a majestic lion in fine French bronze of a verd antique shade; a fanciful clock of the same metal and coloring represents a large globe rolled up an incline by the feet of an acrobat.

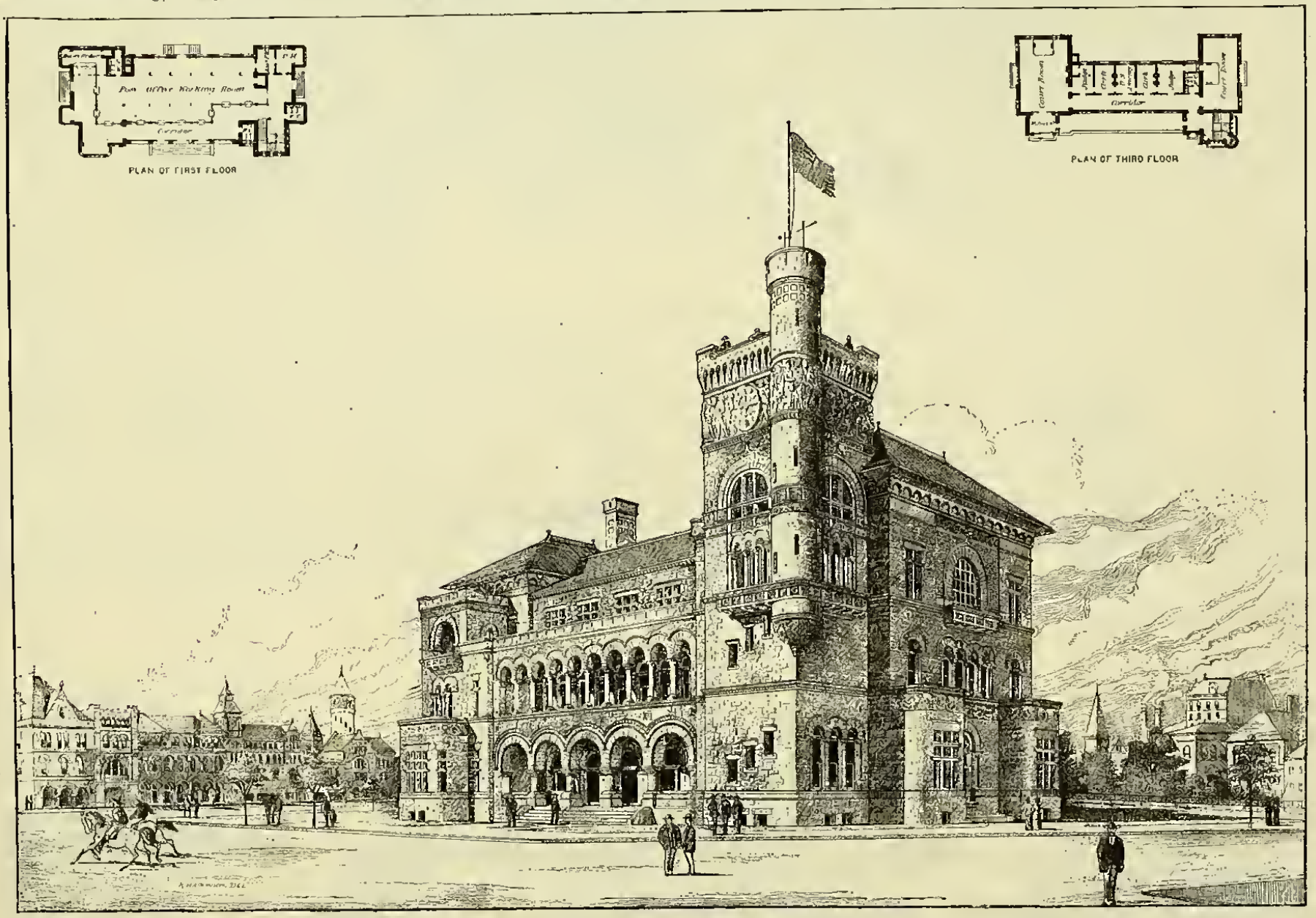
Among attractive and inexpensive upholsterings may be included satin Renaissance, rich in effect, and said to be durable, being composed of worsted and silk; satin de Leon at $1.50 per yard is also a handsome silk and worsted fabric; both are fifty inches wide. A very refined petit point tapestry suited for upholstering or for a portiere shows a gold colored silk ground, brocaded by groups of large flowers in low tones of red, blue, olive, and ecru of very refined effect. Silk brocatelle, now so fashionable, in some fine combinations of color may now be had at comparatively low prices. Moleskin is a fairly durable and rich-looking material printed in rich colors; a handsome example shows an all over poppy pattern in yellows, reds, blues, and olives on a black ground, producing the softest effects. Silk warp tapestry is seen in the new tobacco-colored ground, brocaded by low-toned flowers. Among new curtain materials suitable for hall windows are the East India prints of scarlet and cream, and orange and cream, thin, sheer, and very gay in effect.

Some new rugs called Salonicas are attractive and inexpensive, and some combinations and designs are really superior. Among ground colors of some of these rugs the most pleasing are the peachblow, amber, and slate blue, the designs copies from old Eastern rugs. Salonica rugs are of American manufacture, and are reversible. Some are 30 by 16 inches in size; a thick, rich, deep ecru fringe finishes these rugs at their ends.

Cushion decoration seems to be a favorite form of needlework for summer exhibition. A very attractive cushion now on exhibition shows an all-over conventional flower and leaf pattern worked solidly in dull purple filoselles and old golds on a deep old gold ground, the design outlined by a fine gold colored silk cord, the sides of the cushion finished with moss trimming. Another cushion covered with ivory white sateen is powdered with whorls of oak leaves surrounding a small disk filled in with honeycomb stitch, the whorls and disks worked in gold color and brown silks, the background of ivory white showing scroll outlines in gold silk. A cushion in electric blue plush and satin shows a central band worked with wild roses in shaded outline. A refined-looking cushion of bronze green plush has for its ornamentation groups of conventional palms worked solidly in low yellows outlined by gold thread; a diagonal band of satin between the palms, which were worked in the corners, was embroidered with figures in blue and gold. Among new yacht cushions is one covered with Bolton sheeting, the sides laced ornamentally with old red cords.

Thanks are due for the above information to the Decorative Art Society, Conkling & Chivvis, Edgar Allien & Co., J. B. Shepherd, Stern & Co., and Conover & Co.

Tiles.—No art tiles in Europe surpass those of American manufacture, in purity, richness, variety of glazes, and picturesqueness of composition. Some lately on exhibition are exquisitely clouded in colors ranging from pale yellows and delicate grays to lustrous browns and strong tones of green. Others, made by a new process of glazing, have the glitter of burnished gold, and the delicate colors and sheen of mother of pearl. Many of the sets which come as borders of fireplaces are of marvelous beauty. One effective set is of chocolate brown highly glazed, painted with a continuous design of deep yellow daisies with black centers. In another set on a white ground are shown great bunches of red and pink carnations. Hearths with borders are made to accompany these tiles. Some tiles of terra cotta show a continuous pattern of hawthorn blossoms and are very decorative. Some lovely eight inch square tiles were lately painted by a lady after designs of a fireplace in the tea house at Eden Hall, one of the Duke of Westminster's seats. These tiles, twelve in number, represent the signs of the zodiac, with quaint lettering describing each tile. They are outlined in blue, in a white glazed ground, the letters being also in blue.—*Art Interchange.*



THE NEW UNITED STATES COURT HOUSE AND POST OFFICE, SAN ANTONIO, TEXAS—M. E. BELL, SUPERVISING ARCHITECT.

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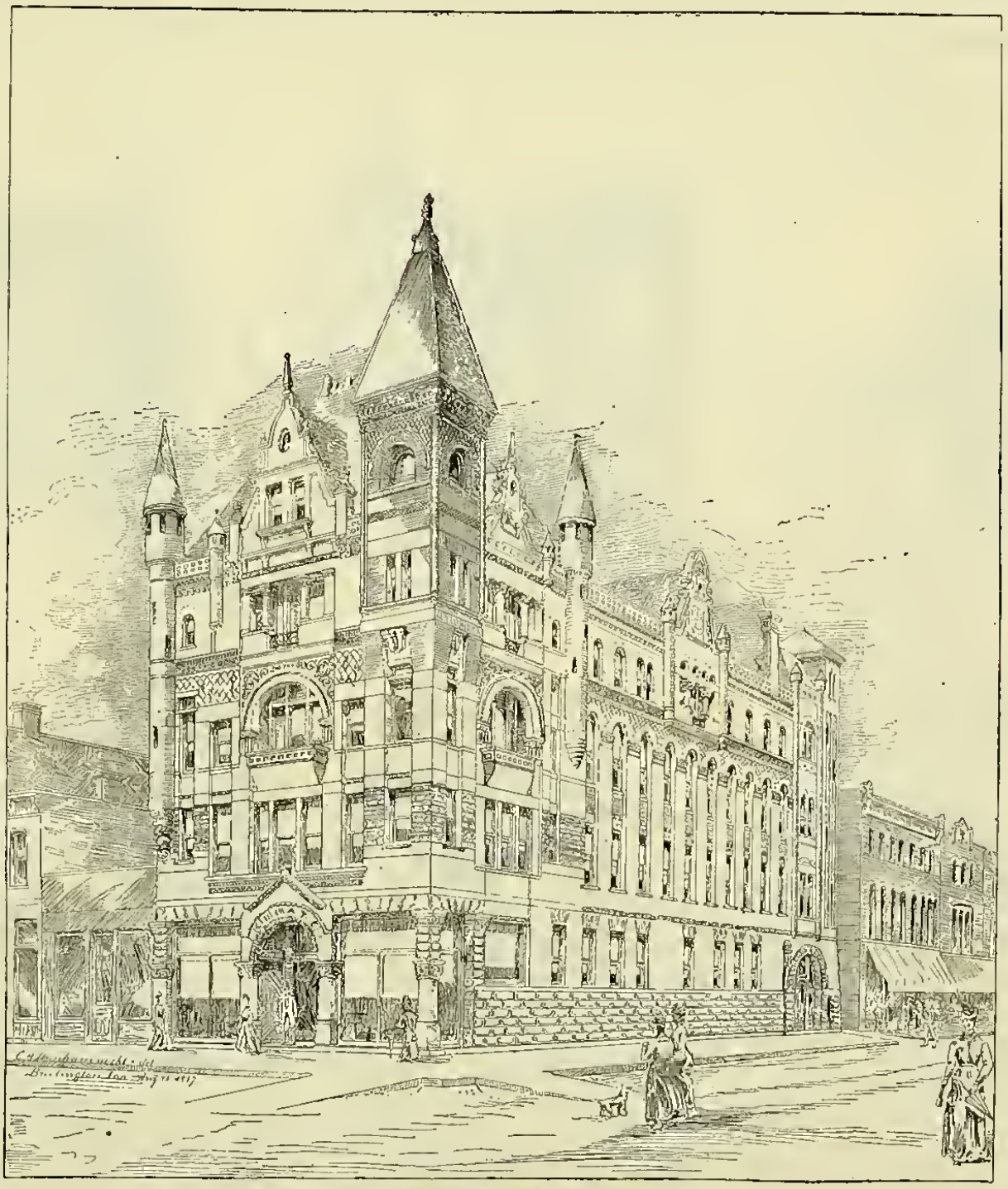
Colored Mortar for Brickwork.

The common bricks of almost any district may be sorted so as to produce contrast in tint or "tone"—red, and yellow or "cream color." This tint of the bricks may be preserved and heightened by using mortar of the same tone or tint. Furnace ashes and lime will produce a dark mortar, pounded red brick or red tile mixed with lime will give a red tone to mortar, and cheap mineral colors may be added to mortar for pointing. The color of mortar is sadly neglected, as generally the same white lime and sand are used for all tones of color in bricks, and not unfrequently white putty mortar is used for pointing the reddest as well as the lightest colored bricks.

DRY GOODS STORE AT WINONA.

The wholesale and retail dry goods house of H. Choate, of Winona, Minn., shown in the illustration, is situated on the corner of Third and Center streets, and is 40 ft. by 140 ft. The most part of the first story is built of jasper, with red granite columns. The rest of the building is built of pressed brick, with terra cotta and brown sandstone trimmings. In the tower seen in the rear is the elevator, which is entered either by the street direct or inside. The basement under the entire building is finished throughout. The inside will all be finely finished. C. A. Dunham, architect.



NEW DRY GOODS STORE, WINONA, MINN.

Blinds.

The editor of the Minneapolis *Lumberman* says that a prominent manufacturer said to him only a few days ago that, in his opinion, blinds were a fraud, but so long as the trade continued to demand them he should furnish them, while not understanding how any sane and sensible man could think of putting them either on or in a house. The inside blinds are little better than dust catchers. They are dirty to begin with, always catching and tearing drapery if any is hung about the window, and are given to getting out of order. Outside blinds positively preclude the use of storm sash, and in this northern latitude the storm sash has proved to be an economy as well as a comfort. It is time the blind was banished, and it certainly is being from all houses of the better class. Only the builders of the hideous white houses cling to them affectionately, and this class is rapidly being narrowed down to country towns and the farms. The money which this class put into blinds, if invested in storm sash, would add immensely to their comfort and save the cost of the windows in reduced fuel bills in the first three years.—*Builder and Woodworker.*

How to Clean and Polish Top Leather.

New enamel leather tops that have become dingy and soiled by allowing dust to accumulate on them, and clammy hands to handle them, can usually be restored to their former bright and clean condition by the use of castile soap and soft water, as described below.

Before applying the soap and water, the top should be thoroughly dusted off; first with the painter's duster and then with a soft cloth. Then to a quart of warm water add half a teaspoon of common washing soda, dip a soft sponge into the water, squeeze it out, rub the sponge on the soap to form a thin lather, and apply the sponge in a gentle manner to the leather. There should be no dripping from the sponge, but coat the entire leather work, including the bows and dash, with a thin coating of the lather, rinsing the sponge before applying it to the soap.

After all the leather work of the job has been treated with the soap and water, then rinse the vessel and the sponge, and get clean water without the soda. Dip the sponge into this clean water and squeeze it out until none will drip from it (by this we mean just a damp sponge), and apply the sponge to a part of the top. Then, immediately, with a soft, clean cloth or soft chamois-skin, rub gently but swiftly until the gloss returns. Continue this process until all the leather work has been gone over. Sometimes it is necessary to apply the sponge twice to certain parts of the leather before the stain or gum can be removed.

The above is our method of cleaning soiled enamel leather tops, which has proved successful; but, before dropping the subject, we will offer a few further suggestions that have occurred to us while thinking over the matter.

After the bindings have been trimmed off from the back and front bows, use a stick specially made for the purpose of blacking the raw edges and designed to avoid getting the black smeared over the leather, for all the different blacks contain more or less copperas, which is poison to leather that contains no oil. After the edges have been blacked, apply tallow to them. This can be done with a tickler and a rag. Then take a stick similar to the one used for the black, and coat the edges with top dressing. This will prevent water from getting in under the binding to rot it away, and at the same time it will give a finished appearance to the raw edges, which, after the top has been dusted two or three times, without the tallow and dressing applied to the edges, will otherwise become conspicuous.

When the job leaves the trimmer's bench, it should be placed out of the way and the top covered over; and, when the job is needed, the top should be dusted off before it goes into the warm paint room; and each time the painter dusts the body off, he should also dust the top, but no water should be used on the leather if it can be avoided. If it is a close top, the painter should be careful not to get pumice on the leather, and when the job is rubbed for finishing, the prop blocks, joints, and nuts should be attended to and the leather cleaned up. When the job is varnished and hung off, it is then only necessary to dust off the top.—*U. No, The Hub.*

A NOVELTY in ladies' watch cases is one-half plain, while the other half is ornamented in pink and yellow gold. The central setting of this case is a clover leaf formed of a ruby, a diamond, and a sapphire.

Screens.

Screens are among the brightest bits of house furnishing, and they can be made of so many designs that one is tempted to indulge the fancy, which makes even the largest, dullest room cozy and bright. A rustic screen can be made at home. For the frame secure poles with the bark still on, have the panels filled with heavy hardware paper, and in putting the sections together use leather hinges fastened with leather-headed tacks. Over the panels put moss, the flat moss which one finds upon stones and trees; attach it with glue, putting here and there tufts of long green moss, while upon the center of each panel an artistic group can be made by mounting a bird's nest among some tiny twigs flatly arranged against the background of moss. Another model has a flat frame of plain whitewood, or any wood most convenient. Cover the frame with an outer row of acorns filled in with beans or tiny cones; give the whole affair a coating of varnish. Have the panels filled with handsome paper or a very thin board, which should be gray or light brown in tone. Upon this background, for the center panel use a group of cattails, spread from the lower right hand corner to the left upper, confined by a ribbon in the center, while upon the outer panels (allowing always three panels for a screen) a group of pussy-willow upon the left, and millet, wheat, or corn upon the right. For bedroom screens the light wooden or bamboo frames are used, the panel spaces being filled by silk, cretonne, or muslin over colored cambric. The material is shirred, leaving a tiny ruffle top and bottom. Small square screens are made of lace and ribbon, while the panels of matting in white or color are simply ornamented with acorns, cones, or bunches of grain. Panels of a material made from wood pulp are very artistic, as the surface is raised in tiny mounds, and finished with metallic luster in gold, silver, copper, or bronze. Linerusta-walton is very serviceable and effective for screen panels to be used in any room, while embroidered panels or painted panels of wood are easily secured. For balcony use in the summer, broad screens filled with panels of common white matting are the most serviceable and appropriate, while the groups of wild flowers which adorn them can be drawn in with a brush, life size. Old-fashioned flowers look best, the hollyhocks, trailing vines of the morning-glory or China rose, while the brilliant glory of the trumpet vine is never more, thoroughly artistic than when allowed to mount in bewildering tangles over a balcony screen. Small screens for the table are made in three panels, filled generally with bits of embroidery in floss, linen, or silk. A small square or oval table screen can be made from a fan supported by a tiny brass holder. This fan should be bordered with lace, and upon the center group a cluster of paper flowers or bird's wings; with a bow of ribbon upon the handle the effect is bright and pretty.—*Amer. Art.*

To Transfer Prints to Wood.

The whitewood used, being perfectly smooth, should receive a few coats of French polish. The print to be transferred, having been dampened with a sponge soaked in spirits of wine, is placed on the wood with a piece of thick cloth over it. A warm iron is then passed gently over the cloth, care being taken not to shift the picture. Keep the iron rubbing backward and forward for ten or fifteen minutes, then take off your cloth, and leave it for some hours. Now get some cold water, dampen your finger in it, and rub the paper. Great care must be taken not to disturb the impression. Keep dampening your finger as you go on. When you have got the paper all off, you can polish over. Any kind of print will do which is not glazed. Ink impressions are the most easily transferred.

FRENCH SEASIDE COTTAGES.

Our drawing, which is from *Architektonische Rundschau*, shows the style for small seaside cottages, as recently erected at Lion on the sea, Calvados, by M. Maget, architect.

These cottages are substantially built, are roomy, but not luxuriously finished. The walls are of stone and brick set in hydraulic cement. The house at the left has a parlor 14 × 20 ft., two bed rooms, and bath room on first floor; kitchen, etc., in basement. Estimated cost here about $2,500. The central house is larger, cost about $4,000. The house at the right should cost about $3,000. The scale shows the dimensions in meters.

Rules for Gas Fitting.

The superintendent in charge of affairs at the gas works now being constructed at Waukesha, Wis., and known under the corporate name of the Waukesha American Gas Company, has promulgated the following rules, to be adhered to by the plumbers of that city when piping houses for gas supply:

1. The following table shows the proportionate size and length of tubing allowed to be run:

Size of tubing.	Greatest length allowed.	Greatest number of openings.
⅜ inch.	20 feet.	2
½ "	30 "	3
¾ "	70 "	10
1 "	90 "	15
1¼ "	100 "	30
1½ "	150 "	60
2 "	200 "	100

No quarter-inch pipe must be concealed, and only six feet for one opening can be used as risers and drops for bracket lights of unconcealed work.

2. The riser in any building must not be less than eighteen inches from the floor for two, three, and ten openings; two feet six inches for fifteen and thirty openings; four feet for fifty and one hundred openings.

3. No riser in any building must be less than three quarters of an inch, except when there are but three openings, when one half inch will be allowed. In buildings with double parlors the drops must be one half inch, with a set from the main line of pipe of not less than four inches, dropped square, and well secured by gas hooks to the joists, the same to be observed on all cross lines of pipe. Drops and side openings, where nipples are used, must be made secure by lock nut, or solder, to prevent them turning inside the plaster, and must be well secured by gas hooks; and where a coupling or L is used on the drop, then a strap or lock nut must be soldered to the drop and fastened to the joists with screws.

4. The rise pipes in all buildings must be placed where the meter and stopcock can be readily got at for the convenience of the consumer to turn off the gas, and for the employes of the company to read the index and put the meter in order when required; and in no case will a meter be set where it will be exposed to damp or frost, or be liable to injury from any cause.

5. Service pipes, when extended from where the company has left them, must, in all cases, be continued the same size as said service pipe laid by the company up to the meter.

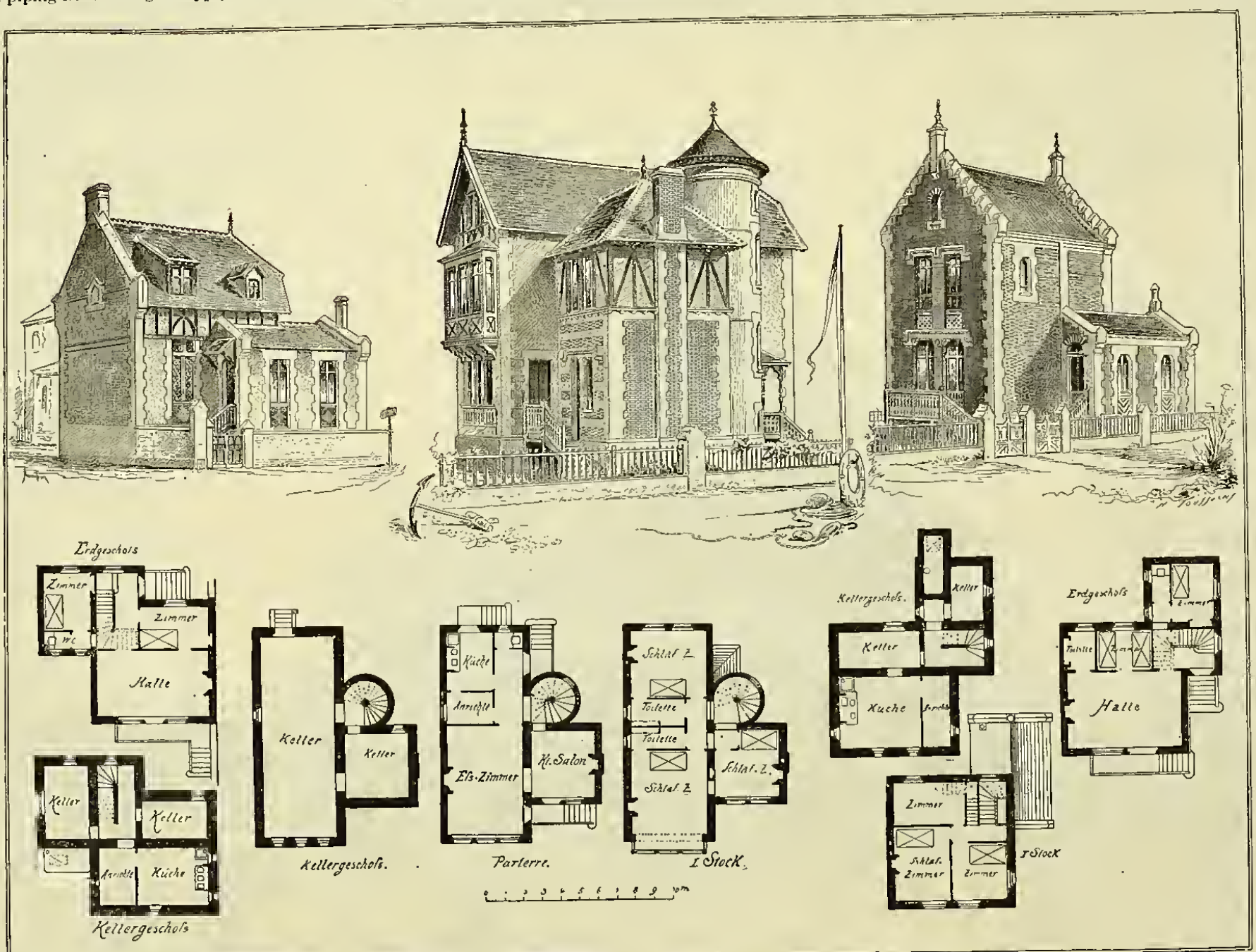
6. In all cases where extensions are made, care must be taken to break the pipe where the rule for sizes can be kept, and in no case must extensions be made from small pipe.

7. All openings must be closed with iron caps, and in no case will lead caps be allowed. No split pipe or broken fittings, repaired with cement or lead, will be allowed.

8. All pipes must be examined by the inspector of the company before being concealed, and due notice must be given by the fitter when any pipe is ready for inspection.

9. For churches, theaters or public buildings, where large chandeliers, reflectors, or sun burners are to be used, the pipes must be of sufficient size.

It is the intention of the company to strictly enforce the above rules, and no certificate of inspection will be given when they are not complied with. To avoid trouble, architects and builders are requested to allow no bill for gas fitting unless accompanied by a certificate of inspection.—*Building.*



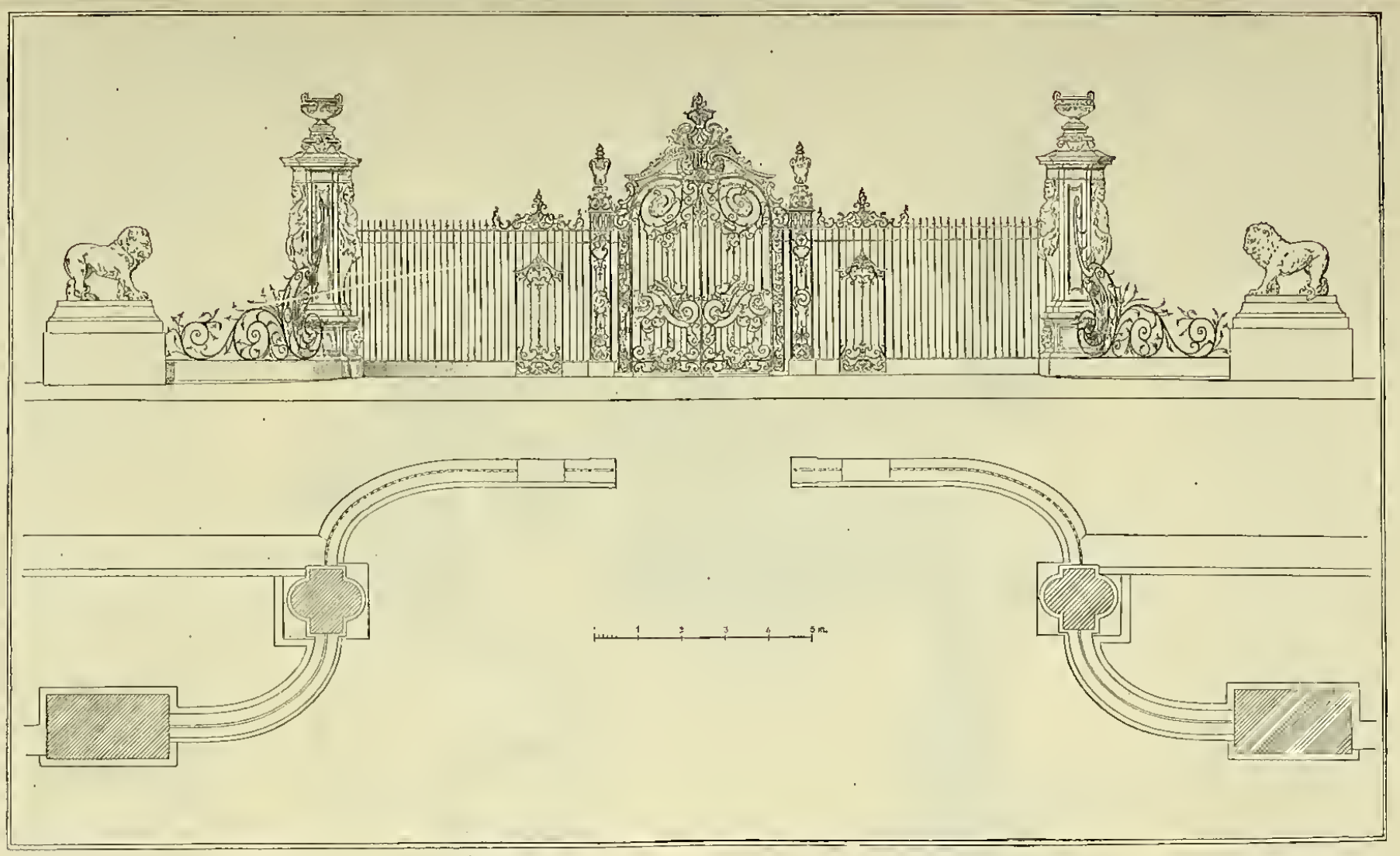
SEASIDE COTTAGES AT LION-SUR-MER, DEPARTMENT OF CALVADOS, FRANCE—M. MAGET, ARCHITECT.

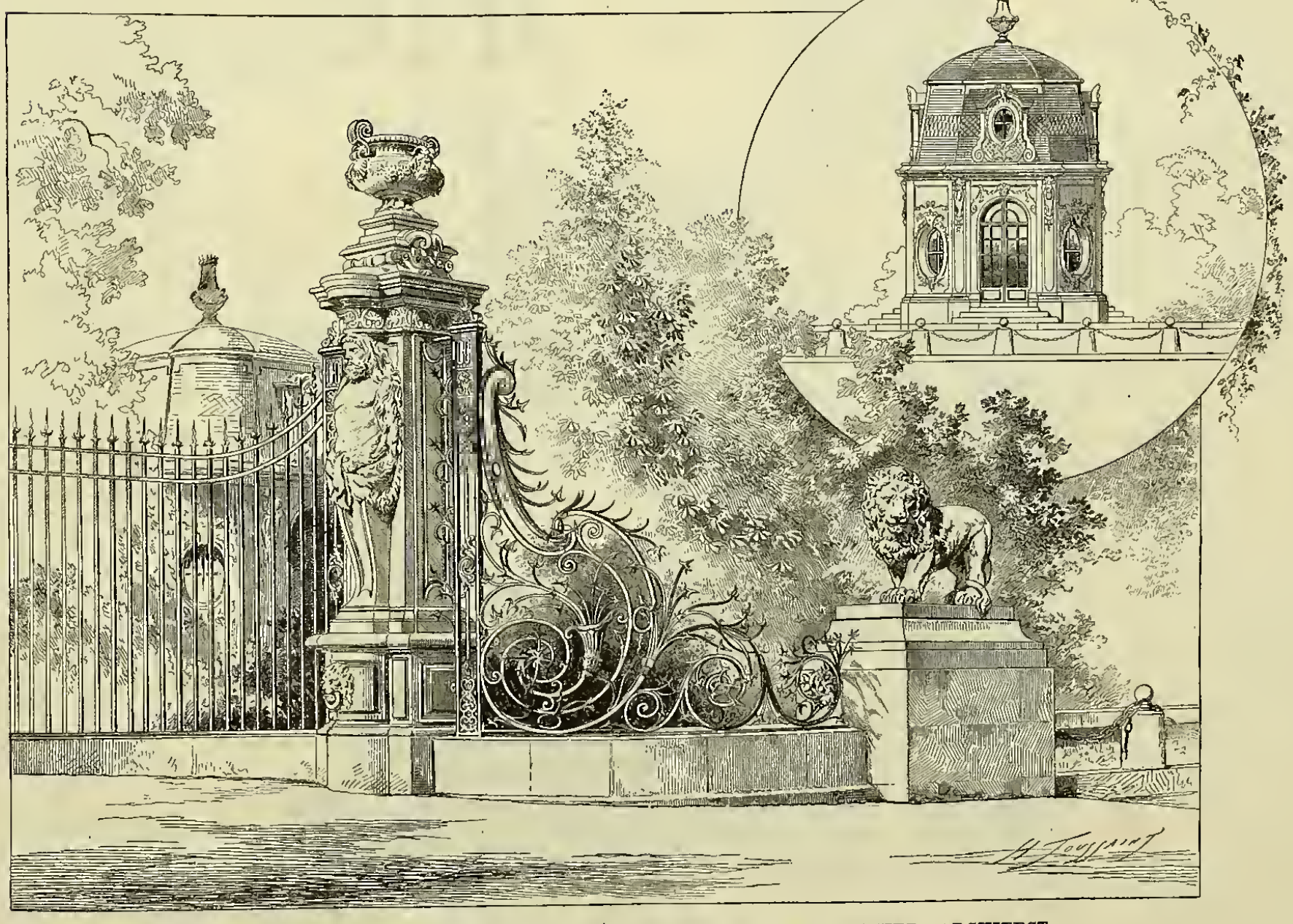
Bichloride of Mercury as a Disinfectant.

Dr. Joseph Holt has the following to say about the use of bichloride of mercury as a disinfectant:

"It is a substance looking somewhat like common salt, exceedingly heavy and difficult to dissolve in water, unless previously mixed with an equal weight of muriate of ammonia. It is dissolved in clear water in the proportion of one part to one thousand parts of water, or about six ounces to forty gallons of the latter. This makes a colorless and odorless solution, which, when sprinkled over the entire premises, both inside and outside of a house, cannot be distinguished from rain water except by a chemist. This dilution is perfectly safe to handle, and is in nowise dangerous unless swallowed. Unlike the horrid carbolic acid formerly in vogue, this is as inoffensive as rain water, so far as its effect upon sight or smell is concerned. Any article of clothing or bedding infected with an infection, such as yellow fever, scarlet fever, small-pox, or other disease transmissible in clothing or bedding, is at once rendered safe by the immediate destruction of the disease germs. In addition to this treatment of clothing, etc., in this manner, every floor of a house, whether carpeted or not, should be thoroughly sprinkled with the solution, omitting for late treatment that of the sick chamber itself. In the summer season the floor of the room could be lightly sprinkled or mopped without prejudice to the patient. There is no more positive way of preventing the spread of yellow fever or scarlet fever in a family than by such simple, easily applied and inoffensive methods as this. In order to prevent any one by mistake swallowing the solution, a little common bluing added to the water would put a person on his guard. Prior to July, 1884, the bichloride of mercury had come into use as a disinfectant dressing in surgery, having been introduced as such in the German hospitals, having been introduced for similar use into England and America. Observing its effect as a surgical disinfectant agent, I argued that it must possess the same virtues if applied in municipal and maritime sanitation, and forthwith formulated the proportions and ordered its use at the quarantine station and in the city of New Orleans, at the same time discontinuing the use of carbolic acid. It was speedily adopted by San Francisco, where the information was republished and extensively circulated. It was next adopted by the United States marine hospital service, and has since become the universal disinfectant in fighting the great pestilential infections. For an accurate knowledge and appreciation of its value as a germicidal agent the world is indebted to the great German bacteriologist Koch, and in this country to Sternberg. I am very desirous that the valuable disinfecting quality of bichloride of mercury should be known and thoroughly understood by everybody, and I will certainly do all I can to disseminate the information throughout the world."

Messrs. Munn & Co., Scientific American office, 361 Broadway, N. Y., are assisted by able architects in the preparation of plans and specifications for all descriptions of buildings. Terms very moderate. We aim to make our estimates accurate and our plans complete, so that when placed in the builder's hands no difficulty is experienced in the construction. Our work goes to all parts of the country, and gives very general satisfaction. We shall be pleased to hear from those who contemplate building.





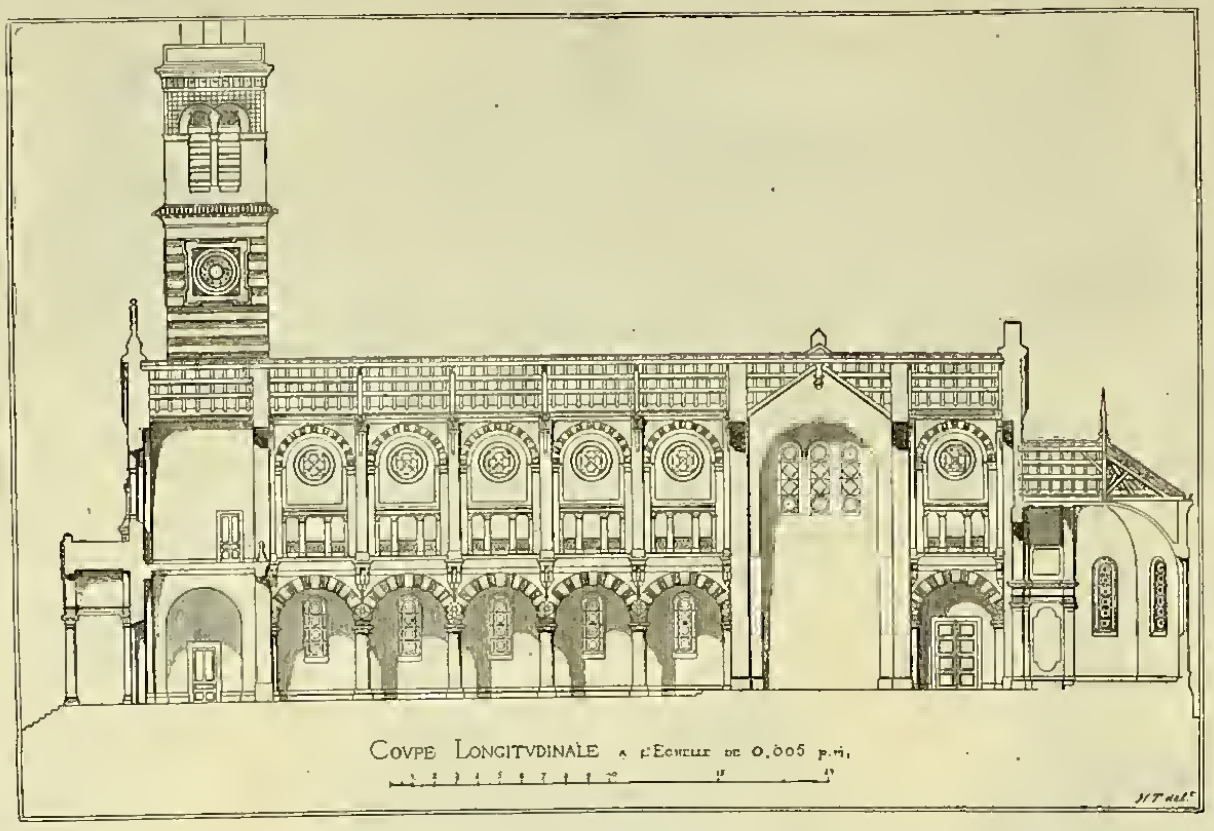
MAIN ENTRANCE GATE, CHATEAU AT BOUGIVAL—M. PASQUIER, ARCHITECT.

Chinese Brickmaking.

As the Chinese are excellent potters, it is not to be wondered at that they are also excellent brickmakers. This is sufficiently apparent, not only in respect to the perfect forms and durability of their common building bricks and tiles, but in the great variety of forms and different sizes of their brick. For common wall work in courses, their bricks in dimensions resemble those of Europe; but in so warm a climate as that of the south of China, many ornamental lozenged openings are required in the walls of houses to promote ventilation, and many ornamental projections, either vertical, horizontal, or curvilinear, are required by the national taste. To execute these features, the builder never need cut a brick. The proper forms are furnished by the brickmaker according to orders issued from the architect. Hence, there are moulded headers for plinths, beveled stretchers for sills, the same for lintels, etc. For mullions they have bricks of various sizes and designs, which fit as parts of the general structure with great exactness, whether as referable to ornamental effect or security of the building. Economy in all things is the ruling passion of the Chinese, and to this may be attributed the pains they bestow in preserving every particle of their brick earth, and saving the time of the builder, which would be lost in reducing his bricks to the required form, and which, it seems, they consider more than compensates for the expense of the moulds.—*James Main.*

CHURCH AT LA CAPELLE.

We give, from *La Construction Moderne*, views of the interesting church, of modern construction, at La Capelle, France, by M. Charles Garnier, architect. The original talent of this eminent architect will be at once recognized in the present work. The arrangement of the tower, its imposing effect and the style of decoration which characterizes the whole structure, show the resources which art may command to impart interest to a church whose dimensions and importance are in themselves rather restricted. The church in its greatest width is about 87 feet by 168 feet in length. Height of roof, 53 feet; tower, 175 feet, 16 feet square. Built in this country, it would cost about $75,000, and have about 1,100 seats.



CHURCH AT LA CAPELLE—M. CHARLES GARNIER, ARCHITECT.

The Long Leaf Pine.

BY THOMAS C. HARRIS.

That the pine is one of the most useful of all the trees common to the South Atlantic States, no one who has given the subject a thought will deny. In North Carolina there are found eight varieties of pines, of which the long leaf, or *Pinus Australis*, is the most useful, though confined to the eastern counties, and not to be seen west of the center of the State. Its range is from the southern counties of Virginia, all the way to Florida, and occupies most of the dry, sandy soil of those States.

In addition to the useful purposes to which this tree has been applied for many years, other uses and new commercial products have been of comparatively recent application. A brief enumeration of these will probably prove interesting.

It makes the best lumber for general purposes, and is commonly used all over the Union. It is from this pine that the turpentine gum is obtained, by chipping away the bark in spring, and allowing the gum to exude and flow down into a "box" or cavity cut to receive it. As is well known to every one, this gum is distilled, and the product is spirits of turpentine, the resin remaining in the still, from which it is drawn while hot into barrels. On cooling, it solidifies into a solid mass of brittle resin, or *colophony*.

There are some fourteen qualities of resin known to the trade, ranging from a coarse black resin to the finest pale amber colored, known as "window glass resin." The prices range from sixty-five cents to three dollars and a half per barrel, according to quality.

The rich, resinous wood and "lightwood knots" are split, and burned in a kiln, and produce the common tar. In the old-school geographies, this "tar, pitch, and turpentine" is set forth as a leading industry in North Carolina. From the fact that this tree is confined to the eastern counties, which were the first ones settled by white people, this statement was made with some degree of truth say a hundred years ago. Now it is but of small importance in the State. In South Carolina and Georgia it is a large industry. From the sap, leaves, and wood are made several forms of proprietary medicines, more or less useful in pulmonary complaints and for external use in the form of liniments.

Within the last few years, the leaves, or needles, have been first utilized, and put into salable forms. Previous to that time, they were occasionally used as a litter for barn yards, etc., for which they were not well adapted, on account of their non-absorbent character. Now the article known as pine hair, or pine fiber, is a new and growing industry. The needles are gathered in a green state, and steamed in a sheet iron vessel, through which the steam passes to a receiver, and is condensed into an oil having an agreeable balsamic odor and excellent antiseptic qualities. This oil forms the base of some of the best known liniments, and is highly esteemed as a domestic remedy for cuts, burns, bruises, and the like. After the steaming process, the needles are crimped by special machines into a close zigzag form for making mattresses, or are carded into a fiber for general upholstery purposes, to which it is finely adapted. In this form it closely resembles oakum, but is much more elastic.

Aside from its elasticity and cheapness for bedding, it has undoubted medicinal properties by inhalation of the pleasant balsamic odor, and the property of driving away insects, especially the *Cimex lecticularis*. The finer fiber is made into rolls of wadding for hospital use, taking the place of lint in surgical cases with decided advantage. The same fiber is also spun into yarn, and woven into a variety of carpets and matting for floors, and is cheap and popular.

The wood is subjected to a form of distillation by a new process, and produces wood spirit, creosote, "soluble pinoleum," tar and charcoal. From the smoke is produced lampblack. The creosote is used mainly for saturating piles, posts, bridge timbers, and cross ties, to prevent decay. When used on piles, it prevents the ravages of the *teredo*, which destroys so many wharves in Southern waters.

The cones, chips, and barks are sometimes saturated with low grade resin, and sold in barrels for kindling fires. The root has medicinal qualities also, and is sometimes so utilized. In the early spring the bark of the root has a sweet taste, and forms an important part of the food of the native "razor-back hogs" running at large in the forest.

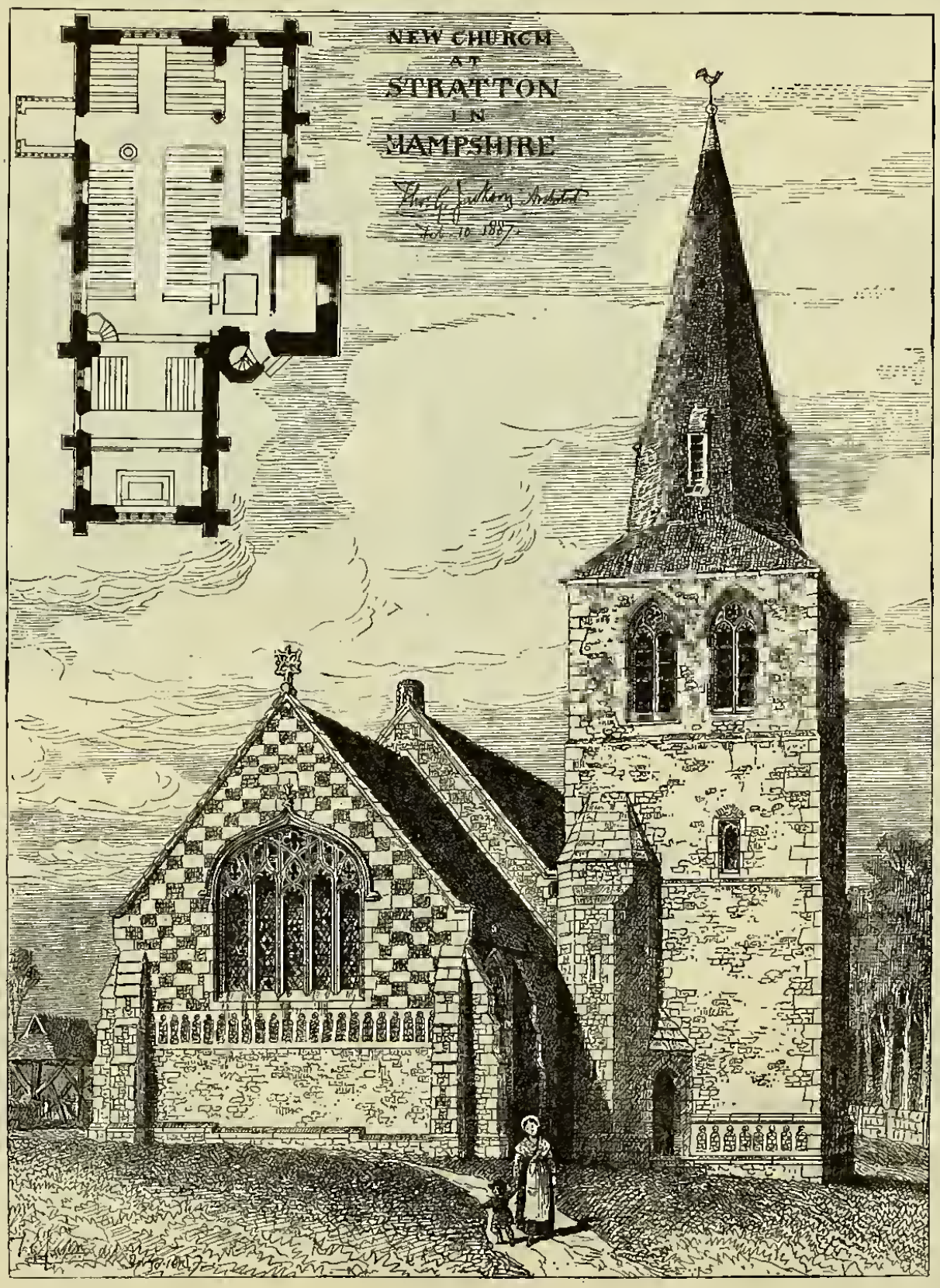
In the dry, upland section, where this pine is the prevailing growth, it imparts some of its healing property to the atmosphere, supposed to be due to a high per cent. of ozone, making it specially beneficial to persons suffering from bronchial or pulmonary complaints. Thousands of well known cases of persons contracting these diseases in colder climates have been much benefited by a winter spent in these pine forests.

Thus we find, as the product of one kind of pine, lumber, shingles, crude turpentine, spirits of turpentine, resin, tar, pitch, lampblack, charcoal, oil from needles, crimped (mattress) needles, carded fiber or pine hair, wadding, carpets, bagging, wood spirit or alcohol, creosote, pinoleum, kindling, and numerous medical preparations. A very useful tree indeed.—*Popular Science News.*

A HUNDRED ACRE peat bog has been discovered near Ellendale, Dak.

CHURCH AT STRATTON.

The new church now being built from Mr. Jackson's designs at Strattou, in Hampsbire, England, is to supersede a very mean modern structure of brick, which stands on low ground in Stratton Park. The new church, which is being erected at the expense of the Earl of Northbrook and the Hon. Francis Baring, is situated on higher ground nearer the village. The materials are brick with flint facings and dressings of Chilmark stone externally and of cbalk internally. The spire is of timber and shingled. The seats and other fittings are to he of oak throughout.—*Building News.*



Decorative Notes.

In a handsome dining room finished in old oak, the high-backed oak dining chairs are upholstered in a manner that adds greatly to the beauty of the room: each chair shows a hand wrought hack and seat embroidery in the old tapestry work which has recently been revived, and for which come the softest old colors in tapestry wools, and designs of charmingly quaint, mediæval style. The chairs under consideration each shows a different design of fruits and flowers: the pear, plum, grape, fig, pomegranate, apple, and orange and various conventional-looking flower and foliage forms furnishing the *motifs*, heing expressed in the most delightful colorings, all subdued and softened as hy time, on a ground of deep but rich hlue; tbe quaint forms of the furniture and the rich eolor of tbe oak setting off the embroidery appropriately. The portieres in this room, which by the way is really an oaken room, having floor, walls, and ceiling in different tones of this wood, are worthy of mention, being unusual in tbeir way—composed of a coarse, deep blue Irisb linen, they are effectively ornamented by a powdering of heraldic-looking figures applied in a coarse, tawny yellow linen buttonholed to the blue linen hy various colored polished Kells's threads; the ornament being the heraldic rose with the five petals displayed, and between them the barbs and seeds, the barbs and seeds heing embroidered in old pink tbreads outlined by brown threads. The rose in each figure is set on a stiff stem, showing two stiff leaves on either side in a yellow green linen buttonboled with tawny yellow threads to the blue ground and veined with the same; the stems embroidered in old red threads. The frieze of each curtain shows simply a row of large heraldic roses without stems, in old pink linen buttonholed with tawny yellow threads, and set between two borders of curiously interlaced patterns worked in old reds, old blues, a faded green, and tawny yellow; these portieres are suspended by oaken rings from an old oak pole set in sockets under the lintel of tbe doorway which opens on the butler's pantry and other closets. The curtains in this room are also of the eoarse hlue linen, but show no decoration save a conventional frieze design of oranges and foliage in outline, worked in tawny yellows.

Some original portieres seen in a library in antique oak are of golden brown plush lined with old gold sateen; the ornamentation of tbe frieze is in colored leather. The design is a conventional sunflower border, treated in orange colored and olive bronze leathers, the brown centers worked in French knots in coarse brown silks, and tbe stems worked in couching and darning stitch boldly executed in heavy olive green filoselles; the large yellow petals of leather are blind stitched to the plush, and then couched in Japanese gold tbread, the leaves in olive bronze leather are treated similarly, and the border as a whole is seen between narrow hands of heavy strands of yellow filoselles caught down by heavy hrown silks; these portieres are suspended from heavy brass poles. Some book shelf curtains in the same room are also interesting, showing a conventional lotus frieze. These curtains are of fine dark old red cloth, on which is applied a frieze band of old red silk sheeting, showing a running conventional lotus pattern, the flower worked solidly in dull blues and olives against a background of olive formed by the leaves, the curving stems of which and of the flower are worked in brown reds. These curtains harmonize beautifully with the old oak of tbe hook shelves and other furnishings. In this room the window curtains are of rich old red Taikun without ornamentation, the rich, lustrous surfaee of the fabric being sufficiently handsome.

In an ivory white and gold parlor, an attractive feature is the ornamentation of some small curtains hanging in front of the open cabinets at either end of the over-mantel. These curtains are composed of pale old pink Henri Deux armure, the pattern of which, of graduated circles, is followed in couching of silver thread, forming a silver and rose curtain of very ebaste and delieate effect, suiting well with tbe ivory white woodwork. The shelves of these cabinets are lined with an old pink plush, showing a silvery bloom in keeping with the curtains. Another cabinet in this room has curtains of East Indian embroidery in gold, on a creamy cotton ground, between an upper and lower band of old pink plush. The window curtains in this parlor are of pale blue Henri Deux armure, and show deep friezes of pale blue plush, on which appears a design of interlacing disks couched in outline with silver cord, the disks being boldly darned in pale old pink, silver green, and lemon yellow filoselles alternately. The carpet in this room is a Wilton of French Renaissance scroll pattern in warm drabs, on an old gold ground, light, yet rich, in its effect, which resembles the silver and gold Florentine tapestries.

An exceedingly rich mantel valance in a handsome drawing room is composed of silk velours of a dull but warm purple shade, set between two bands of Irish crochet in raw linen thread laid over the rest of the plush, which throws its pattern out in fine relief. The lower hand of crochet is finished at the bottom with leaf points, making a lace finish. By the tip of each point is suspended a rich tassel of dull purple silks and raw linen thread, with heading of silver threads. This lace bears no resemblance to the ordinary crochet and has not been, like it, commonized by constant use. To gain its most pleasing effect it must be done in the deep, warm-toned raw linen threads. In this same room the portieres of the same shade show a broad frieze insertion in the same quaint old lace, treated even more boldly than the valance insertions, or rather overlays of the same lace. A very rich effect is gained in a pair of sofa cushions made for a white and gold tete-a-tete sofa, the outer covering being formed of English point in gold threads and braids; the pattern, an ornate rose and foliage pattern, is richly thrown up by an inner cushion cover of rich pink Roman satin. The small sofa has a tufted seat cushion in pink and gold brocade, and these cushions stand upright at either end. In this same room a wall curtain over a satinwood upright piano is composed of pink satin damask, the figure of which is followed in gold thread with very chaste and rich effect.

A table, made by the village carpenter, and covered and decorated by the ladies in the house, is now in use in a Newport drawing room, occupying the center of the room. It is rather large, has a circular top, and four straight legs, inclining outward. A flat piece, about fourteen inches wide, is placed against the legs, about six inches from the floor, forming a sort of square dado or wainscoting around the table. This piece has three round openings in each of the four sides. It is covered, as are also the legs and top, with rich maroon silk plush, drawn tightly, and nailed with small tacks. A deep ball fringe of maroon color edges the top, and is put on with small gilt tacks. Pretty blue and white china plates are inserted in the openings, and a lovely lamp, of blue and white china, stands upon the table.

A rich and effective cover for a small table is a square of dark red or maroon plush, unlined, but trimmed with a wide fringe of gold or maroon silk tassels. When this is placed upon the table, the cloth is drawn up on each side to the top, making an irregular festoon, and is fastened there by a bow of gold-colored satin ribbon.—*Art Interchange.*

New Galvanizing Process.

Johann Arthur, of Rietz, has invented the following process for coating iron with zinc. The tank containing the hath of melted lead and zinc is divided into two compartments hy a refractory partition, strengthened by iron framework. This partition does not reach the bottom, so that the metals are kept in fusion, as it were, in two communicating vessels. The objects to be galvanized are first passed through the melted lead, then, passing along the bottom, come into contact with the zinc, which fills the other division of the tank, so that the objects are heated out of contact with the air. The bath of zinc can thus be kept low, thus avoiding oxidation, while the objects receive a thin and highly resistant coating of zinc.—*L'Industria.*

FULL drawings, details, and specifications, ready for the builder, for any of the buildings illustrated in this publication, may be obtained at this office on moderate terms. Munn & Co., architects, 361 Broadway, N. Y.

EARTHQUAKE FOUNDATIONS.

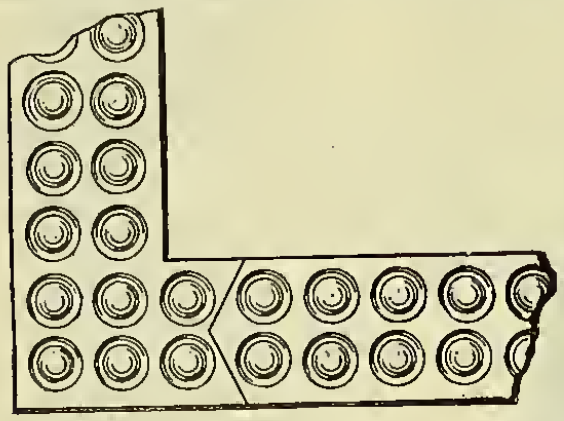
To the Editor of the Scientific American:

I send plans of constructing foundation of buildings, which, if employed, I believe, would save a house or any structure from damage by an earthquake of ordinary violence.

The idea is quite simple, so that little explanation of the plans is necessary to a full comprehension of them.

The structure above the foundation rests on steel balls. These balls are inclosed between two iron plates or castings.

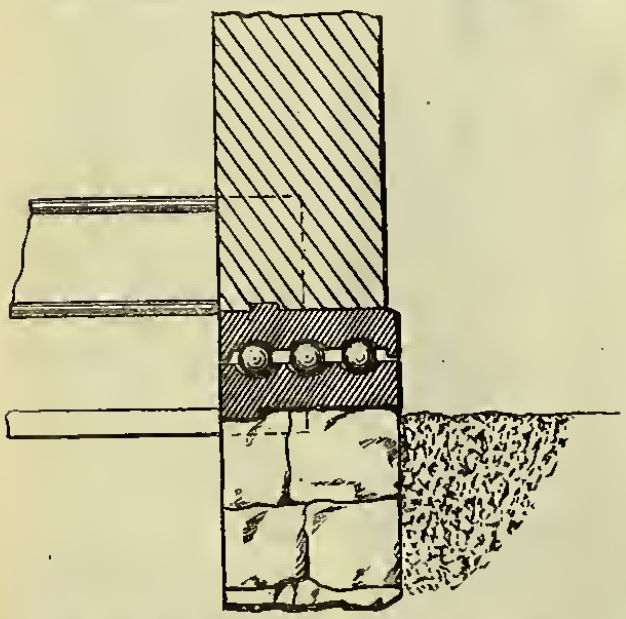
I have supposed that an earthquake would not damage the foundation of a building, provided the grade comes up to the top of what is called the "foundation wall," or if it is otherwise strongly braced; and that if some mode of construction could be employed which would permit the foundation to be moved suddenly in any lateral direction without carrying with it



the structure above, damage by earthquake would be largely if not wholly obviated.

The weight that each ball, according to my plan, would have to bear is represented by a surface of only six inches square. To look at it from another point of view, each ball has to bear as much weight as a layer of mortar six inches square. The weight of massive structures seems to be the main object to be contended with, and it seems that in every case the balls would be more than strong enough to perform their part. The more massive the structure, the thicker must be the foundation. This method of construction can be applied to any form of building.

Braces and binding bolts would be needed that I have not shown in the plans. They should in most cases be secured to the metal plates from parts projecting to receive them. To secure the metal plates both above and below the balls, as well as the balls themselves from rust, it might only be necessary that paint and paraffine should be used. A coat of paraffine alone



would, in all probability, prevent rusting for ages. The opening represented between the edges of the two courses of plates by the letter A, on the full size vertical section, should be pointed with mortar, thus excluding the rain and moisture.

I have supposed iron to be used for stays, braces and joists. If wood should be used for joists, a special arrangement would have to be provided for securing them to the metal plates.

It is probable that a wrought ball of steel would resist more pressure than one cast. BEN. HILL.

Tiona, Warren Co., Pa.

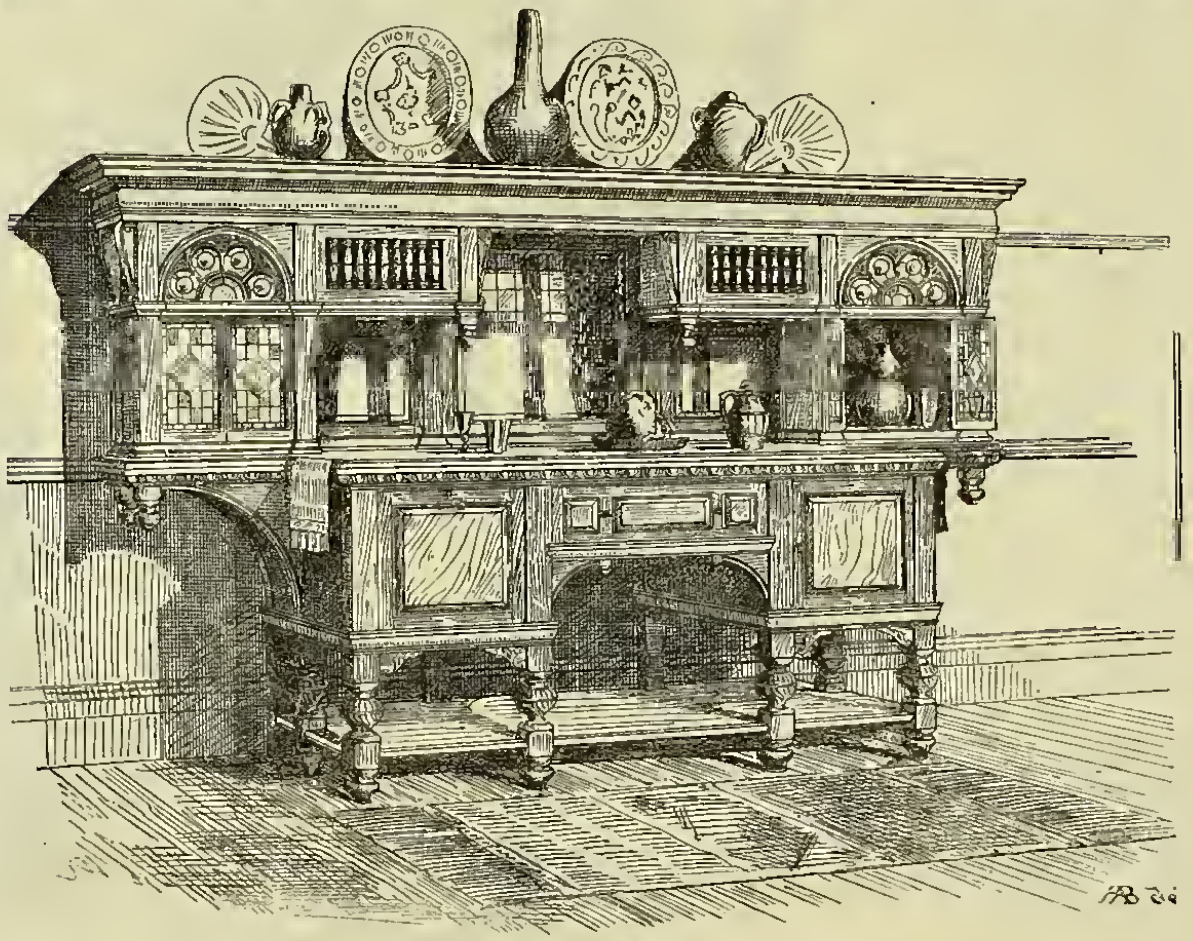
REMARKS.—The above plan is practicable, although not new or untried. The noted engineer D. A. Stevenson was the first one to announce the principle of the aseismic joint (see a paper by him in the "Transactions of the Royal Scottish Society of Arts," 1868, vol. vii., p. 557, entitled "Notice of aseismatic arrangements adapted to structures in countries subject to earthquake shocks"). An ordinary Japanese house consists of wooden uprights resting on rough round stones (see article upon floors and ceilings, by C. P. Karr, in our paper), which are virtually aseismatic joints; but the roughness prevents any lateral movement from a slight oscillation. The size of the balls shown in the plans submitted are too large. Any movement within a house resting upon such large balls would cause a violent oscillation of the whole structure, with damage to the furniture, etc. The balls should be reduced to the size of buckshot. Mr. H. S. Ridings, formerly Resident Engineer of the Iquique Railway, Peru, has proposed a simple, cheaper, and effective plan of free foundations, viz: To interpolate a layer of clean, coarse sand one inch thick, in a convenient position, care being taken to prevent it escaping laterally and from being washed out. The free movement foundation principle is admirably adapted to resist horizontal oscillations, which seem to be the most destructive because most common, but the ball arrangement would not provide for vertical oscillation, in fact, it would be detrimental as lessening the inertia of the building. The plan is an excellent one to support a heavy roof upon, but not a light roof, for the latter might be lifted off by a cyclone. The detail instruction about pointing up the interstices with mortar between the foundation and the superstructure would invalidate the whole plan of a free foundation. Instead of being pointed up, an iron collar should be bolted on to the upper side of the iron beam and come down over the lower beam, not touching the latter and hiding the joint and protect it from the weather. The supposition that an earthquake would not damage the foundations of a building will only hold good when that foundation is of the heaviest and most substantial nature, and built at the very least ten feet below the natural surface.—EDS.

Care in Respect to Fire.

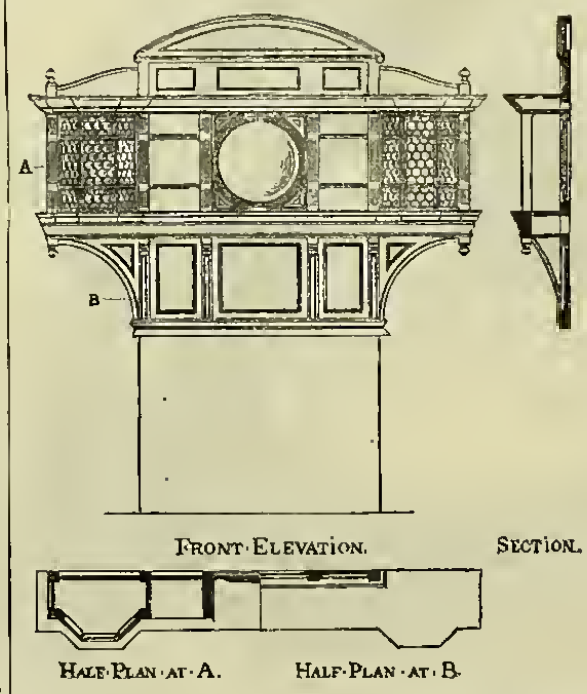
It is wonderful how some property owners hang back when a suggestion is made looking to the safety of their property by the adoption of some simple safeguard. "Am I bound to put in buckets of water?" "Is my insurance vitiated if I don't put them in?" "What reduction will you make in my rate if I do?" It never seems to strike them that it is worth while to make themselves as secure as possible against fire on their own account. It never seems to enter their heads that every establishment that is burned for the lack of ordinary safeguards is being paid for in their present rate. It never seems to occur to them that if the merchants refuse to help to reduce the fire loss, the rates must stay where they are or go up. Above all, it never seems to occur to them that they must pay all the losses, and that the insurance companies are only the agents to collect the money from them. And they can't escape it, either, any more than they can escape any other relation modern society has prepared for them.—*St. Louis Examiner.*

A SIDEBOARD IN WALNUT.

This sideboard is of walnut, the side projecting cupboard doors being filled with lead glazing, the centers being of beveled glass, and the lead work gilt. Behind the balusters to the top cupboards silvered glass is placed. The sideboard was designed by Mr. R. A. Briggs, London.—*Building News.*



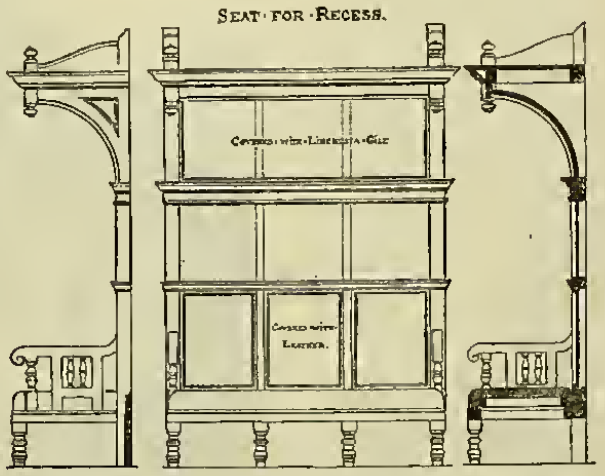
HANGING CUPBOARD.



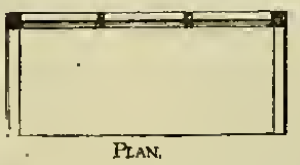
FRONT ELEVATION. SECTION.

HALF PLAN AT A. HALF PLAN AT B.

SEAT FOR RECESS.



SIDE ELEVATION. FRONT ELEVATION. SECTION.



PLAN.

A SIDEBOARD IN WALNUT.

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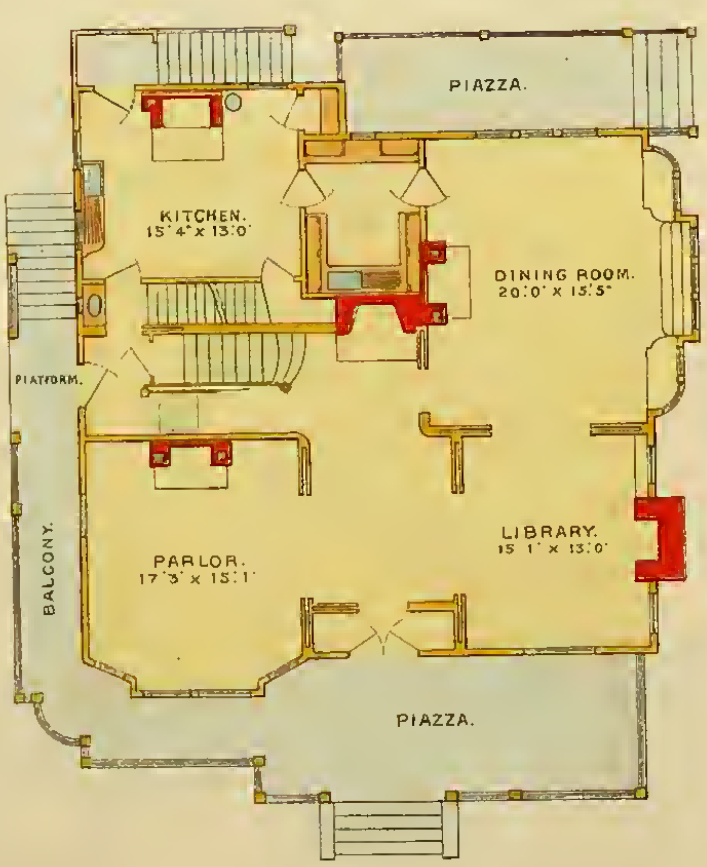
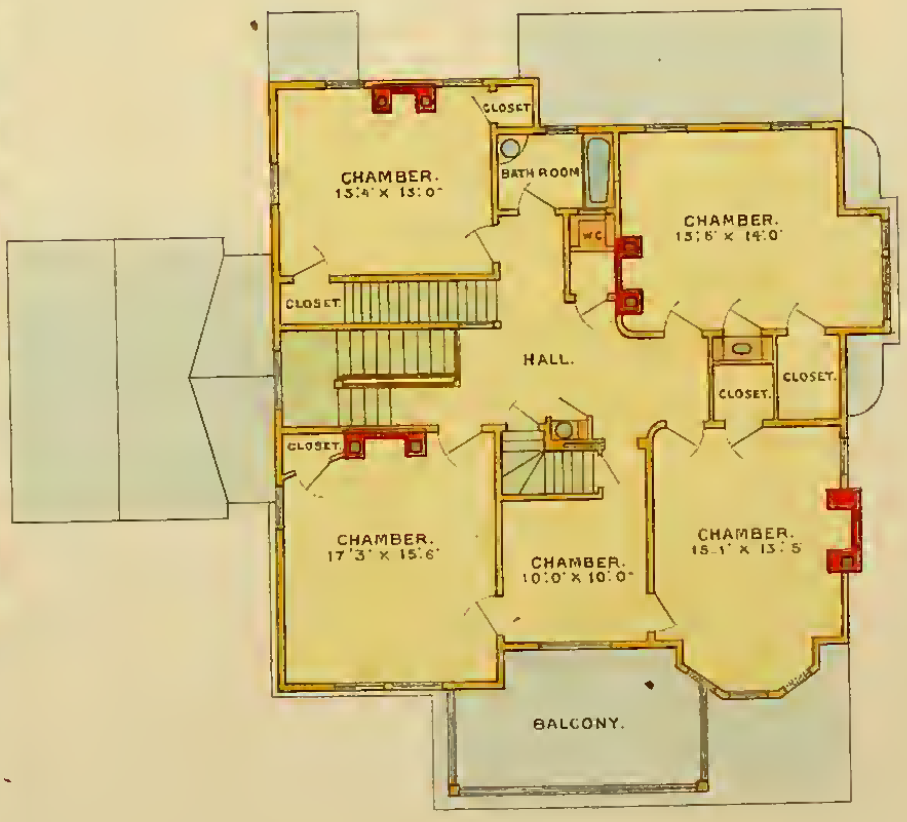
A RESIDENCE OF MODERATE COST.



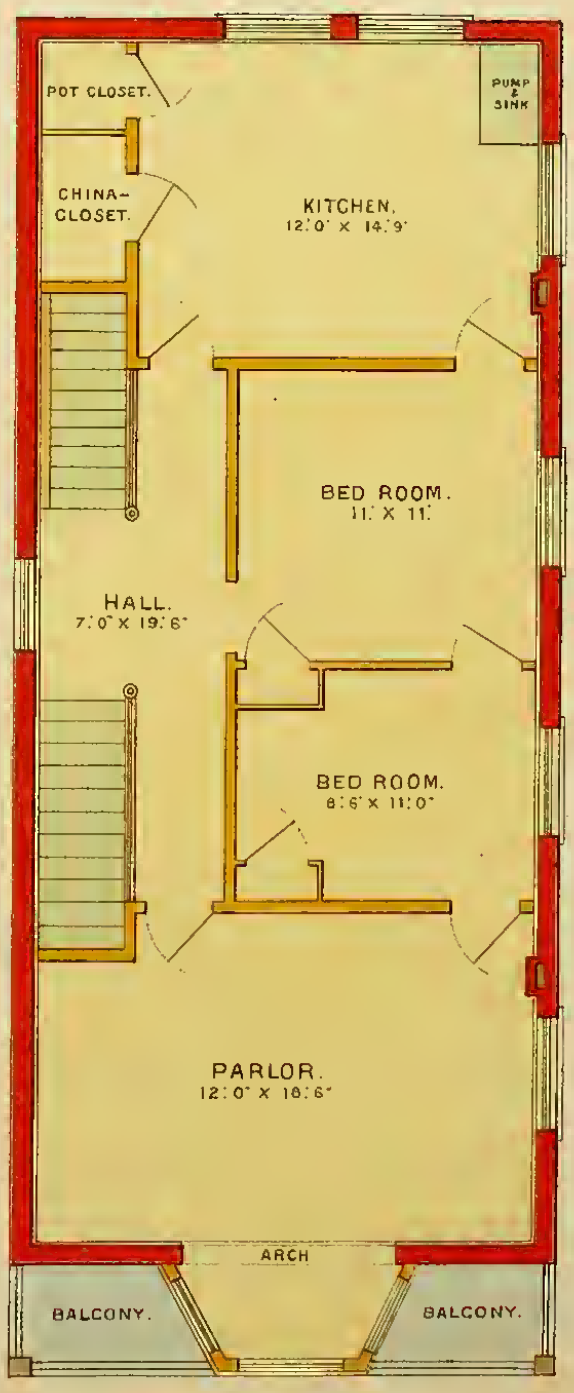
Plan of First Floor.



Plan of Second Floor.

A COUNTRY STORE AND FLAT.

Plan of First Floor.



Plan of Second Floor.

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THE PHILIPPINE EXHIBITION AT MADRID.

Among the richost possessions of the Spanish empire are the Philippine Islands, long celebrated for the great variety and value of their products.

An exposition of the principal productions of these islands has lately been inaugurated in Madrid. We present herewith a view of the exposition building, which consists of a ligbt and graceful pavilion of iron and glass, 175 feet long, 90 feet wide, and 80 feet high at the cupola. It has an elegant front, with a fine stairway, and a portal supported on Grecian columns. Ricardo Velazquez was tbe architect, well known for many excellent works. It was opened on the 30th of June last with great pomp, by her Majesty the Queen Regent.

Among those present were a large number of the aboriginal inhabitants, Philippians, dressed in their native costumes. They presented a rare and attractive appearance. The objects exhibited show the various forms of dwellings of the aborigines. Tbese for the most part consist of cabins or huts mounted on posts at a considerable elevation above the ground.

One of the tribes bas a dwelling arranged upon a tree top 30 feet high.

NEW EXHIBITION BUILDING OF GLASS AND IRON, AT MADRID.

A great variety of interesting objects are collected, illustrating the manners and customs of the natives, their manufactures, forest and other productions, fauna, etc.

In future the exhibition building, which is located in the park of Madrid, is to servo as a permanent colonial uuseum.

Finger Nail Paint.

How to clean the paint and putty from under the finger nails, so as to have them free from all impurities, is a question that often puzzles some painters. It is a well-known fact that more trouble arises from heedlessness in this respect than from almost any other source. In a painter's experience, you often hear tho remark made: "We know he is a slouch; why, just look at his nails." And notbing looks so untidy as dirty finger nails. A very good plan, and one that is easily carried out, is to get a stiff tooth brush and a little water, drop a small quantity of ammonia into it, and tben use the brush, rubbing well the ends of the fingers. You can wash them off with white castile soap afterward. The ammonia whitens the skin, and takes the yellow stain out, caused by the absorption of the oil into the pores. We are decidedly of the opinion that it is more preferable than just the soap alone, as we have tried both. Tbe ammonia need not be used so strong as to cause tbe fingers to become sore, or to injure them in any way; just enough to eat the paint or varnish, or whatever has become accumulated there.—*Carriage Monthly.*

Healthy Habitations and Defective House Construction.

An absolutely perfectly constructed dwelling does not exist so-day! This is rather strong language, or assertion, but it nevertheless is true. Science teaches us that to bave an absolutely healtby dwelling, we must have uncontaminated air to breathe. Are our present-day houses constructed to guaranteo this?

We propose to speak of defects, not strictly applicable to plumbing; but realizing tbe necessity for other branches in the arcbitectural line to advance with the present-day sanitary improvements, we propose to point out a few glaring defects that plumbers are not responsible for, and many times are unjustifiably held accountable for.

The first defect we desire to call attention to in the present-day mode of house construction is the enormous amount of dead air space in each and every dwelling. To more clearly make this understood, we will designate every empty, unventilated space in any portion of a house, dead air, life-destroying elements tbat prevail to an alarming degree in every house, as constructed at the present time. These dead air spaces are between floors and ceilings, partitions, hanging ceilings and roof, recesses in party and side walls, front and rear walls, unused flues, under the steps of stairways, under stoops, around plumbing fixtures. The latter we have condemned before, until now fixtures are left open with no casings. Tbis guarantees cleanliness in this particular, and pure air.

Tbe dead air space in sliding-door partitions, dumb waiters, passageways, alcove rooms, and last, but greatest of all evils, unventilated closets, soiled clothes receptacles, etc.

Show us a house, to-day, without these defects, and we will acknowledge you have a healthy house to live in. We care not how well we plumb or how expensive the plumbing fixtures are, if tbe house construction is defective, with thousands of cubic feet of dead air spaces, as mentioned, the good plumbing will often be condemned in consequence of these glaring architectural defects.

The remedy lies in every architect's bands. Who will be the first to institute it?—*Plumbers' Trade Journal.*

Ivory, Silk, and Gold.

Tbe most elaborate example of interior decoration work lately designed in New York has just gone on, says the *Star* of this city, to embellish tbe San Francisco home of ex-Senator J. B. Flood. The house, which is only two stories bigh, is in all its parts a wonder of Louis Quinze and *rococo* magnificence; but a boudoir in ivory, silk, and gold, on tbe second floor, is mentioned as a special bit of luxurious art. This room, which opens from a ball in English oak, arranged as a picture gallery, connects two bedrooms reached from opposite sides. The woodwork is in enameled cherry, with a wainscot three and a half feet bigb; a border of the wood, with its gilded decoration, marks also tbe division between wall and cove. This band is on a line and uniting with tho upper section of the door frame, which bears the distinction of a handsome piece of carved work.

The walls are covered by hangings of satin damask laid on plain, showing a floriated scroll pattern in tints of blue and pearl. The wide covering is adorned in hand modeled relief, the design showing a continuous lattice work with interlacing vines, and the figures of dancing Cupids breaking through at intervals. Above this is a moulding indicating an oval, and connected with spandrels filled by wreaths. By the introduction of a colonnade an open sky effect is produced in the ceiling with its heigbt of eighteen feet. The perspective, in which the balustrade surrounding this central oval is treated, is enhanced by the added adornment of vines trailing over the rail.

A distinctive feature of the room consists of two wall brackets or cabinets in framing of ivory and gold, with delicate lines in brass work forming a border inclosing beveled glasses around a center mirror. Tbe furniture, of Louis XV. style, is upholstered in silk lampas with exquisite bright figurings on a pearl tinted ground. The doorway hangings are of plush in a pineapple shade, richly embroidered in *appliqué* and witb silks of different shades and ribbons in combination. The coveriug of a white table at one side is made to correspond. A crystal chandelier hung above the doorway is supplied with candles to illuminate so fair a scene in a fortunate man's habitation.

Frosted Glass.

To give glass an appearance as if covered with frost, brush over the surface of it a concentrated solution of sulpbate of zinc in water to which a little gum has been added.

ST. GEORGES VILLA AT SAINT LO.

St. Georges villa originally comprised hut one parlor, a dining room, and a kitchen on the ground floor, three hed rooms in the first story, and various secondary rooms in the attic. Upon the whole, it was a small dwelling that it was desired to turn to account in a general project looking to the comfortable installation of quite a large family.

Admirably situated, moreover, upon a high hill, it faces in such a direction that one can take in at a glance the picturesque grouping of the houses of Saint-Lo around the cathedral and the long perspective of the valley of the Vire to the west. The annex buildings, therefore, could not be allowed to hide this view; on the contrary, it was logical to arrange them so as to take every advantage of the latter.

This explains the longitudinal extension of the present villa, which, on the ground flour, comprises a dining room, a parlor, a library, a winter garden, and a billiard room, connected hy a glazed gallery forming a covered terrace.

In the wing to the left are the kitchen and its dependencies, the servants' dining room, servants' stairway, etc. In a pavilion to the right there is a study and the main staircase

The upper stories contain ten hed rooms, with toilet rooms, water closet, bath room, etc. The attic contains a large number of servants' rooms.

Stalls for five horses, a room for coaches, a laundry, and quarters for the gardener are arranged in a special building.

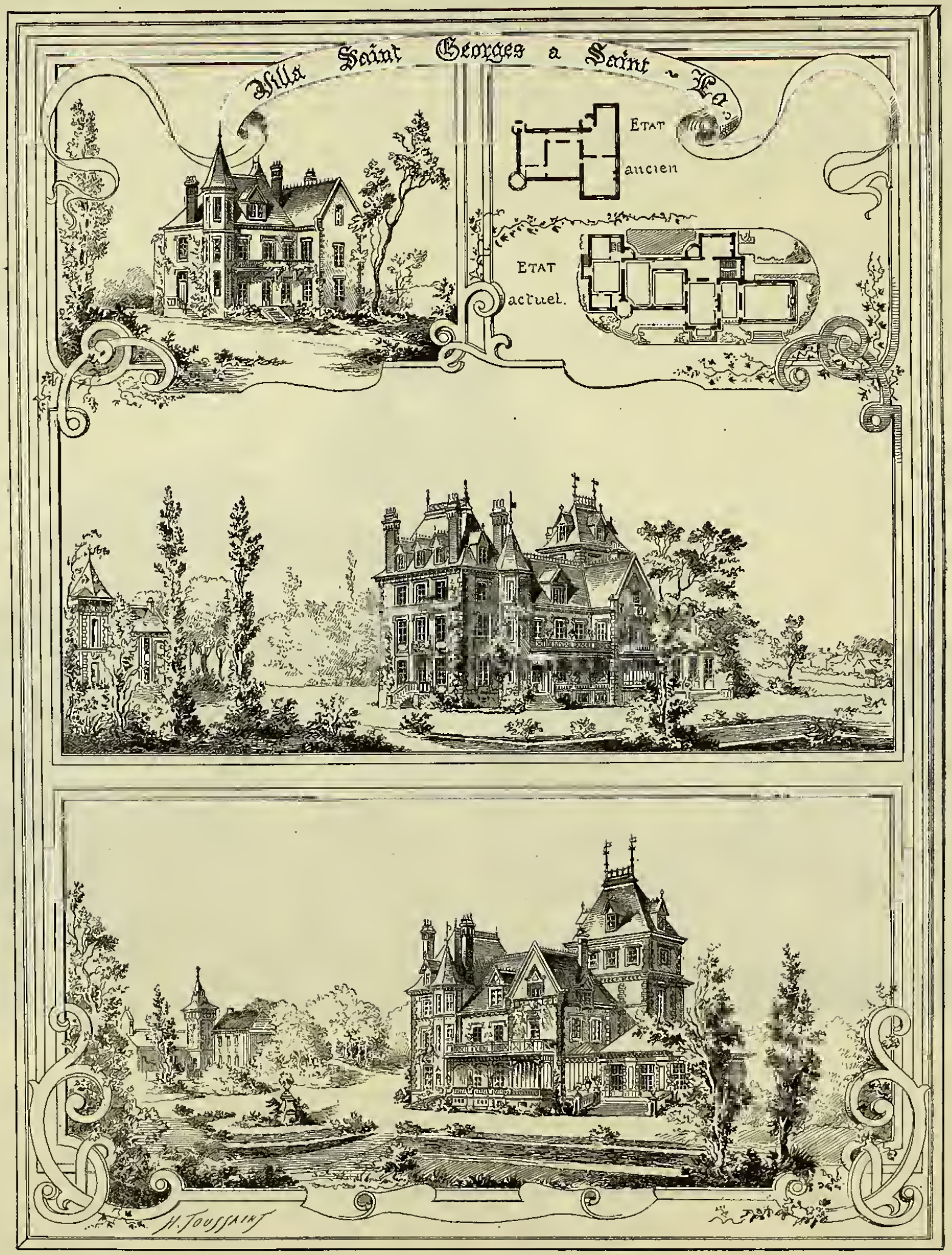
As frequently the case in the country, water derived from rains is collected either in cisterns or reservoirs, from which it is distributed to the various stories. Iron plate reservoirs of a capacity of 3,280 gallons, placed in the upper part of the pavilion to the right, above the grand staircase, receive water from a well in the kitchen. The water is forced up by a pulsometer actuated by a small vertical generator. This system gives the hest results With a minimum expenditure of coal, water is forced to a height of 60 feet to supply the reservoirs.

The main rooms are heated by a hot air stove, and the heat of the kitchen furnace is utilized for warming the atmosphere of three rooms in the upper stories.

The masonry work was executed with the schistose ashlar of the country, laid in Airal mortar of hydraulic lime. The bricks likewise came from Airal.—*La Construction Moderne.*

The Effect of Sea Water on Concrete.

Those who use Portland cement concrete will be interested in the discovery to which the *Scotsman* drew attention recently. It appears that the Aberdeen harbor sea works have suffered considerably. The concrete blocks have been seriously affected by the sea, and the authorities have been rather puzzled to account for its destructive action. Very great reliance has been hitherto placed by engineers and architects on Portland cement concrete; but this good opinion has been somewhat shaken, if all that we hear of certain hydraulic works can be substantiated. We take our information from recent accounts that have come to us. Indications



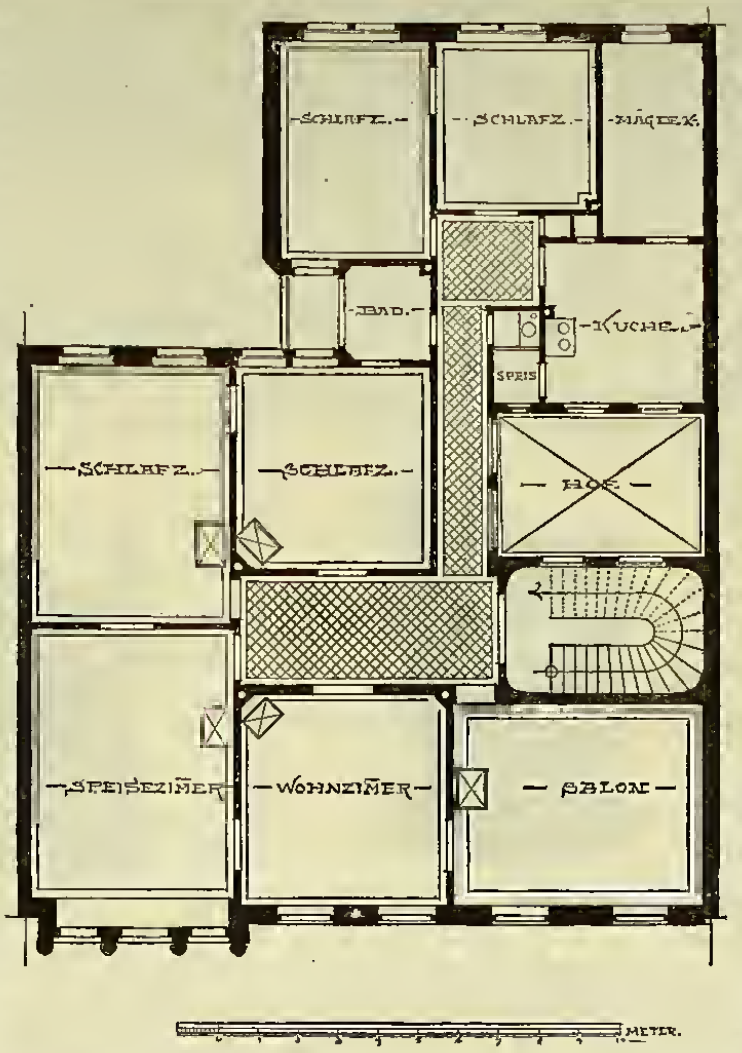
VILLA S^T GEORGES à S^T LÔ (Manche)—ARCH.^TE M. CAMUT.

of failure bave been observed for some time in important sea walls constructed of concrete, and the Aberdeen harbor works, if what we learn is true, confirm the misgivings which are entertained. The action of sea water on concrete has been suspected of late years; but up to this time a satisfactory explanation of the damage sustained has not been given. Experiments have been recently made by direction of the Aberdeen authorities by Professor Brazier, of Aberdeen University, and Mr. William Smith, the harbor engineer. The decayed concrete has been ascribed to the force of tbe sea and wind, though the action was chiefly noticeable in the graving dock in still water.

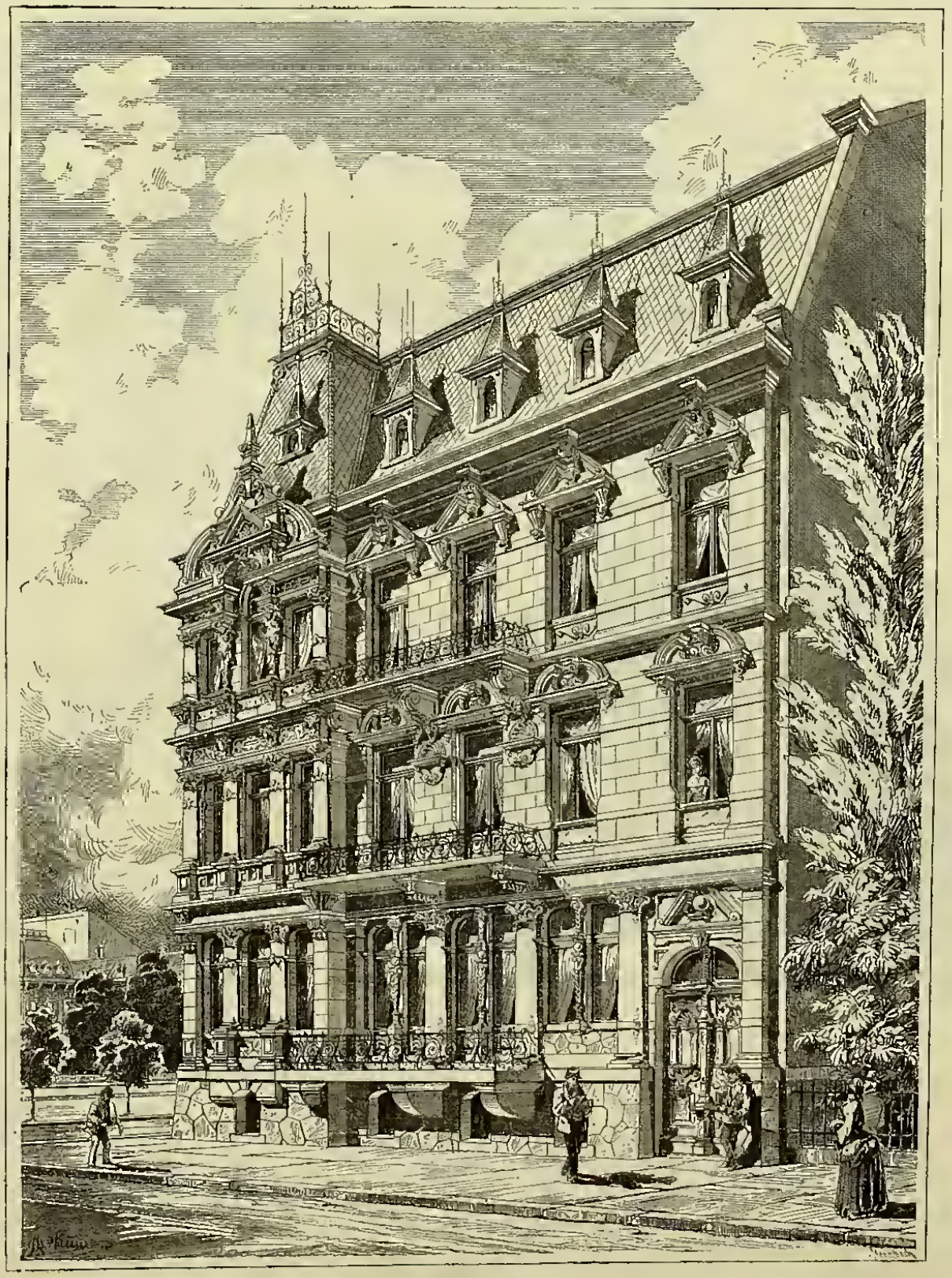
The writer in the *Scotsman* says:

"It is the action of the sea water under pressure in still water that has rendered the nature of the damage in the present instance so conspicuous" The quay walls and breakwater were constructed fifteen years ago, tbe graving dock two years ago, and in all these works a disintegration of the surface of the concrete by tbe chemical action of the salt water bas been going on. The entrance walls are said to be built of Portland cement concrete, composed of one measure of cement, two measures of sand, and three measures of stones, with large rubble stones incorporated in the walls. The wall surface is plastered with Portland cement mortar up to 3 ft. of low water, the mortar being made of one measure of Portland cement and one of sand. Tbe upper part of wall is faced with granite.

During the process of emptying the water from the graving dock, a hydraulic pressure varying with tbe tides of from 5 lb. to 11 lb. per square inch is put on this concrete skin, tbe water forcing its way through the pores of the skin, producing cracks and saturating the quay walls. The chemical action is hastened in proportion to the exposure, and is increased by the passage of water through the body of concrete. Various injuries are reported—*e. g.*, tbe joints of the ashlar facing have opened in parts, owing to the loosening of the concrete surface beneath. Tbe engineer consulted Professor Brazier. Test briquettes were prepared for analysis with a view of discovering the proportion of magnesia contained, and which was supposed to account for the damage. The Portland cement, it was found, had not contained more than one-half per cent. of magnesia, whereas the decayed concretes showed an increase in the quantity of bydrate of magnesia of 13½, 15, 22, and in one case as much as 40 per cent. This could only have been derived from the sea water. Another deleterious substance found in the decayed concrete was carbonate of lime, which could hardly be traced in the Portland cement of tbe same standard. The concrete taken from the south breakwater showed it to have undergone a similar chemical change. The outer quay walls surrounding the side of the graving dock were built of plastic concrete or Portland cement concrete, mixed in tbe usual way with a certain quantity of water, and allowed to set two to four hours, then broken up and deposited within frames under water in skips with opening bottoms, the concrete being left *in situ* in the frame. These walls do not show tbe same action or decay. Portions have been rebuilt with Roman cement concrete under water, but no decay has been noticed in them, and the only protection to the Portland cement concrete from tbe chemical action of tbe sea is apparently a non-porous lining or facing of stone-work. Every care is said to have been taken in tbe concrete used. The cement bad withstood the mechanical tests, and the concrete had set hard. Tbe same failure of Portland cement concrete was noticed by Mr. Harrison Hayter, vice-president of the Institution of Civil Engineers, two years ago. After a time tbe concrete expanded, vertical walls of the material lifted some inches, and tbe surface cracked and flaked off. In every case a white "cream like" substance was observed in tbe concrete, which Mr. Hayter had analyzed, and was found to contain 80 per cent. of magnesia hydrate, consisting of about two-thirds magnesia oxide and one-third water. In every case of decayed concrete, magnesia was present. Professor Brazier's experiments are confirmatory of the fact that these deposits of decayed cements contain magnesia, but he believes the substance comes from tbe action of tbe sea water, and is not present in the Portland cement, as Mr. Hayter thought to be the case. We cannot enter into tbe details of the experiments made by Prof. Brazier on the cement blocks, and the results he obtained by digesting some of the cement in sea water, from which it appears that the amount of lime and magnesia contained in the sea water in its original state is accounted for after tbe cement had been separated from the water, there being a gain of lime and a loss of magnesia amounting to nearly all tbe magnesia contained in the sea water. Hence the same authority concludes that Portland cement cannot resist the action of sea water.—*Building News.*



SECOND FLOOR PLAN—CITY RESIDENCE, MANNHEIM.



A CITY RESIDENCE IN MANNHEIM—WERLE & HARTMANN, ARCHITECTS.
From Architektonische Rundschau.

Vassar College Sewerage.

Vassar College, Pougbkeepsie, N. Y., has a system of sewage disposal for its 2,000 of population that might well engage the attention of sanitarians tbe world over. It is simply the dry earth system, and is represented by those concerned to be perfectly successful, inoffensive, and inexpensive. It is also extremely simple; consisting merely of two large but shallow tanks (for alternate filling and emptying), the bottom guttered for the effluent, and covered with a layer of gravel.

Above this gravel bed is a loose flooring of boards, on which is spread a thick layer of soil from tbe college farm. Tbe sewage from all the buildings flows into one of these tanks, distributed over tbe area of the soil filter, so long as the effluent passes off clear, into a neighboring stream. When the effluent grows impure, tbe sewage is turned into the other tank, and the workmen employed on the college farm shovel out tbe muck created by the mixture of organic matter and soil, and cart it back to the fields to be replaced by a fresh layer therefrom. So powerful and rapid is tbe bacterial digestion and tbe absorption of the disengaged products by tbe salts, carbon, etc., of the soil, that it is asserted, and credibly, that no offensive odors are experienced either from the effluent or in the removal of the muck. The organic matter is so far decomposed and assimilated with soil in the average time of its stay in the bed as to be ready for almost immediate absorption by vegetation, and the fertility produced is said to be most exuberant.

Where there are contiguous farms sufficient to utilize the sewage of any community, it is not easy to imagine anything either simpler, cheaper, or more perfect than this plan. Within a reasonable distance farmers would gladly cart in their soil for the privilege of carting it away again as a rich fertilizer.—*Sanitary Era.*

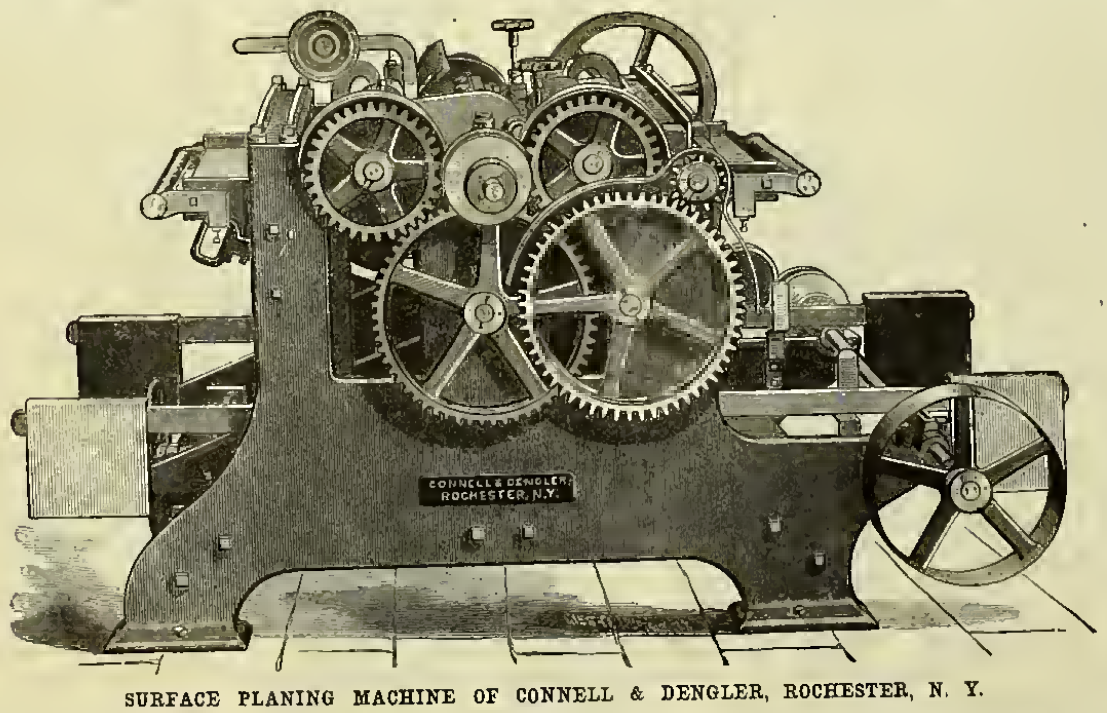
Preservation of Stone.

Limestones are for many reasons eminently suitable for constructive purposes, being cheap and easily worked, but they readily absorb moisture. This, as it usually contains carbonic acid, gradually dissolves away the material of the stone, and in winter serious injury is often caused by the freezing of this water and its consequent expansion. Several methods of rendering this material less porous have been proposed, but not unfrequently the remedy has been worse than the disease. Alkaline silicates were at one time in favor for this purpose, but in its application soluble hygroscopic alkaline carbonates are formed, which seriously affect the utility of the process. Moreover, unless care is taken in the application of these silicates, a hard, impervious varnish is given to the surface of the stone, within which the water used in dissolving the silicates is imprisoned, and on the first frost serious disintegration takes place. MM. Faure and Kessler have recently been at work on this question, and as the result of their experiments, recommend the use of metallic fluosilicates, more especially those of aluminum, magnesium, or zinc. The surfaces to be treated are brushed over with a solution of the salt chosen, causing on the first application an abundant froth, due to the liberation of carbonic acid gas. When dry the operation is repeated once or twice, depending on the quality of stone; on an average for soft stones 1·7 lb. of solution at 4°° Baumé are required per cubic yard. The advantages claimed are: That the process is completed in twenty-four hours; it allows the stone to be polished, and by a suitable choice of fluosilicate used, different colors can be communicated to it; and lastly, the process is cheap, and applicable not only to stone, but to all cements and mortars containing lime. The theory of the process is that a double decomposition occurs, forming in the first place silica, calcium, and aluminium fluorides and carbonic acid gas; secondly, a reaction takes place between the limestone and the aluminum fluorides, producing alumina, calcium fluoride, and carbonic acid. In this manner each grain of the limestone is covered with an insoluble coat, materially increasing its resistance to atmospheric influences.

AN IMPROVED SURFACE PLANING MACHINE.

A strong and compact planing machine, of moderate cost, and embodying many late improvements, is shown in the accompanying illustration, and is manufactured by Messrs. Connell & Dengler, of Rochester, N. Y. It can be made to plane as wide as thirty inches, will plane very short stuff and not chip the ends, and will make so fine a surface that it is an especially desirable machine for furniture manufacturers, making the stuff ready to go through the sanding machine. The bed plate, containing the lower feed rolls, can be raised and lowered, for various thicknesses of stuff, by means of inclined sides, which gives it a solid base to rest upon, and at the same time insures accuracy of adjustment. A scale is arranged in view of the operator, indicating the point at which the machine is set, and any change in thickness can be effected without stopping or moving from his working position.

The feed rolls are five and a half inches in diameter,



SURFACE PLANING MACHINE OF CONNELL & DENGLER, ROCHESTER, N. Y.

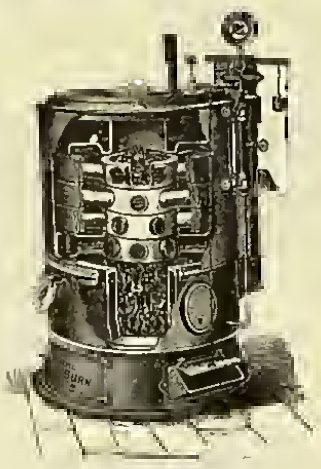
all geared and driven, and planing any desired thickness up to six inches.

The feed pressure is by weight and lever, the weights resting on stops, excepting while a board is feeding through, and the feed works are controlled by a tightener. The cylinder is forged steel, belted at both ends, and has heavy journals running in babbitt lined boxes of great length, insuring solidity and steady motion. The countershaft has twelve-inch tight and loose pulleys, six inches face, and should make 1,000 turns per minute. The weight of the machine is 4,000 pounds.

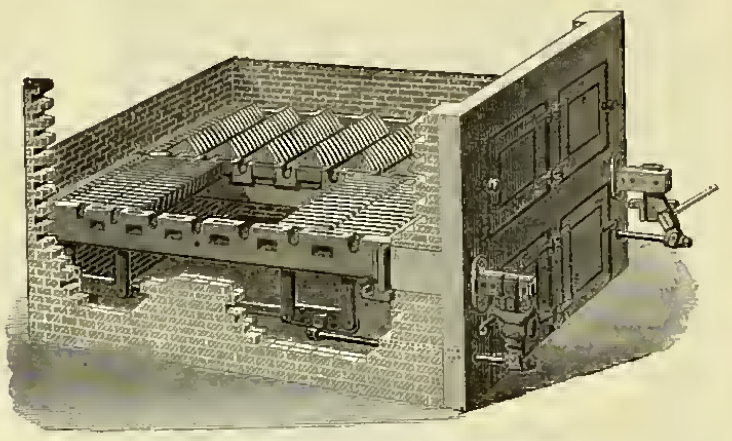
THE "AUBURN" BOILER FOR STEAM HEATING AND THE WOODCOCK PATENT SHAKING GRATE.

A boiler for steam and hot water heating which gives a great amount of effective fire surface, which requires but little attention in operation, and is not liable to get out of order, is shown herewith, and is manufactured by Messrs. Woodcock & Co., of Auburn, N. Y. Above the fire pot is a middle section of simple but novel construction, consisting of inside and outside hollow rings connected by hollow arms, and coming one above another, so that the inner rings form a fuel magazine entirely surrounded by water. The boiler is made entirely of cast iron, and is so constructed and put together as not to be injuriously affected by sudden or severe variations of temperature.

The same firm also manufacture a shaking grate—



"AUBURN" BOILER.



THE WOODCOCK PATENT SHAKING GRATE.

the Woodcock patent—which is made of a number of interlocking segments, as shown in the illustration. Each of these segments has bearings at both ends, and by means of downwardly projecting arms attached to a horizontal shaking bar they may be tripped up at the same angle simultaneously. There is a self-locking arrangement to keep the grates level, preventing their points from being burned. The shaking apparatus can be applied either on the inside or outside of the boiler front, the latter way preventing any dust arising and stopping the necessity of opening the doors in order to shake the fire. The grates keep a uniform distance apart in shaking, and cannot pass each other, except in order to dump the fire, thus preventing coal from dropping through, no matter how inexperienced the fireman may be.

Furnaces provided with these grates afford the largest amount of air space possible, thus giving the greatest draught and the most perfect combustion, supplying the largest percentage of steam with the least consumption of coal. They are adapted to burn coal of any size.

Design in Architecture.

What are the means by which a satisfactory architectural design may be obtained? The best general answer that can be given to this question is, perhaps, that which was given by the painter Opie to a young artist from the country, who, struck with the brilliancy of Opie's coloring, timidly ventured to inquire with what he mixed his colors. To this the gruff old painter briefly replied—*Brains!* In that one word is the whole theory of architecture. If a man will only think of what he is doing, and think of that only, I defy him to produce a bad design. A vulgar man may impress something of his own vulgarity upon it; a weak man something of his feebleness; but if the position of the art is up to the mark of the age, these will not be perceptible to the general eye. An earnest, purpose-like design, pretending to be nothing but what it is—going straight to its object, and giving evidence of careful study and thought—must always be pleasing, not only to its contemporaries, but through all ages, even if neither ornamented nor ornamental, while no extravagance lavished on a falsehood can remain tolerable beyond the fleeting fashion that gave rise to it. To descend a little more to particulars, the principles of design in architecture may be classed under four distinct heads, thus: Convenience in arrangement; economy in construction; ornamental arrangement; ornamental construction. The first two belong, properly speaking, to the builder, or to the engineering part of the profession, and only the last two, strictly speaking, to architecture; but unless he gets them done for him, which sometimes, though rarely, may be an expedient arrangement, no architect must neglect the former two. Indeed, the foundation of all good architecture is that the building shall be so arranged as to meet the purposes for which it is intended in the best possible manner. This alone will not suffice to make a building beautiful, but it will go as far toward it as almost any other quality, and nothing that can be added will redeem the want of it.—*J. Fergusson.*

Ebonizing.

One of the English furniture gazettes gives the following account of the French process of ebonizing: One of the most ingenious as well as serviceable methods practiced by French artisans in wood is that by which is produced a complete resemblance in the color, beauty, and density of ebony by the skillful use of charcoal upon the surface. None but carefully selected woods of close and compact grain are employed for this purpose, and these are covered in the first place with a coat of camphor dissolved in water, and almost immediately after with another coat composed chiefly of sulphate of iron and nut gall. The two combinations in blending penetrate the wood and give it an indelible tinge, and at the same time render it impervious to the attacks of insects. On these two coats becoming sufficiently dry, the surface of the wood is rubbed at first with a very hard brush of couch grass and then with charcoal of substances as light and friable as possible, the fact being that if a single hard grain remains in the charcoal it will scratch the surface, which should be perfectly smooth. The flat parts are rubbed with natural stick charcoal, the indented portions and crevices with charcoal powder, and, alternately with the application of charcoal, the article operated upon is rubbed with a flannel soaked in linseed oil and turpentine. These pouncings, repeated several times, cause the charcoal powder and the oil to penetrate the wood, insuring a beautiful color and a perfect polish.

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HOLBROOK HALL, NEW YORK—LATELY CONDEMNED FOR DRY ROT.

[For description see page 104.]

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Disinfecting Sick Rooms.

Dr. H. Gerould, of Cleveland, O., writes to the New York *Medical Journal* that the following proved to be all he could desire, viz., 3 drachms of potassium nitrate dissolved in 8 ounces of Platt's chlorides, full strength. In this he saturated thin muslin (cheese cloth), then dried it thoroughly. When it was necessary to cleanse or purify the room, he burned small strips of the cloth on a shovel in different parts of the room and under the bed clothing. All offensive odors disappeared. This was repeated, when necessary, the potassium nitrate being used to aid combustion. The result was such that no discomfort was experienced by the attendants, and no offensive odor could be detected in the adjoining rooms. This method of disinfection, the writer adds, would be equally efficient in all contagious, pestilential, or infectious diseases.

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CITY FRAME HOUSES OF MODERATE COST.

Our colored plate illustration this month is a view of three fame dwellings situated on south side of Jeffer- Ave., near Ralph Ave., Brooklyn, by Chas. E. Hebberd, architect, 62 Broad St., N. Y. The lot is 50 ft. front, and the dimensions of each house 16·8 by 36' deep. Cellar of stone, basement of brick; 12' walls front and rear, and 8' party walls; two stories above, of frame, filled in with brick.

The design of front is a decided innovation over the customary stereotyped city house, and meets a want that we feel our readers will appreciate.

Our experience is that the general public are becoming tired of the monotonous row after row of exactly the same design of city house, and there is a demand for houses of this description, while the ordinary front remains unsold and unoccupied.

The general ground plan is about the same as the average city house, with flat tin roofs and party walls

In fact, this arrangement has been thoroughly worked over and experimented on, and yet still retained as near perfect as can be devised for one-family houses with the narrow city lot.

The exterior will bear a few explanations. The bay window on both parlor and second story and the large one-light window in basement make all the front rooms decidedly inviting. The judicious use of sawed shingles along the front and at the base of bay serves to relieve the monotony at small cost, and the ornamentation in gables and in panels under bay window gives a decidedly bright, artistic effect.

This ornamentation is all worked from the solid, rather than planted on. Details of much of the ornamentation will be found on the supplement sheet. The frame is sheathed on all sides, filled in with brick laid on edge, covered with building paper, and then clapboarded. Plastering throughout is three coat work. Slate mantels in parlors and dining room, and fireplace heater in basement. The net cost complete, including plumbing, was $2,500 each.

A DWELLING FOR $2,500.

Specifications of materials and labor required in the erection and completion of frame dwelling at Belleville, N. J., according to drawings made for the same by Charles G. Jones, architect, 280 Broadway, New York.

For dimensions, etc., see plans.

MASON WORK.

Excavating and Grading.—Excavate to the depths required for cellar, walls, piers, cistern, cesspool, privy, and drains.

Dispose of the surface earth so as to use it for finishing the grading at completion.

Remove all surplus earth or rubbish to a suitable place of deposit. Do all filling in required around walls, pipes, etc., and thoroughly ram the earth and grade off as directed.

Foundations.—Build up foundation walls of good building stone laid in cement mortar. Plaster the outside of wall from bottom to grade with a heavy coat of cement mortar. The piers for piazza and stoops to be stone, and to go 8' below cellar bottom.

Build up piers in cellar of hard brick and cement mortar, with stone caps for girders.

Where walls and piers show above ground, the stone work is to be pitched face, and the joints are to be neatly struck and marked. Point up properly where exposed inside. Furnish and set to all cellar windows proper stone sills 4"×8" neatly dressed.

Build foundation of stone under cellar outside steps, and carry up brick risers on which to set bluestone treads, laid in cement mortar.

Cesspool.—Build a cesspool with dry walls, of large size field stone, at a distance of 50 feet from house, where directed, and dome the top with hard brick and cover with stone flag 2 feet square. Size of cesspool, 6'×6'.

Drains.—Lay from house to cesspool a 5 inch heavy glazed tile drain, joints to be pointed up with cement.

Privy Vault is to be stoned up same as cesspool, and where directed, and to be 4'×6' and 5 feet deep.

Cistern.—Build a cistern where directed with hard burned brick laid in pure cement mortar. Walls 8' thick and domed over. Plaster the inside in a workmanlike manner with Portland cement mortar, and clean out and leave intact. Flag over the top 2' 6" square.

Chimneys.—Carry up the chimneys, as shown, from foundations, with hard burned brick in good lime mortar. Joints to be well filled and struck smooth inside.

Where exposed, bricks are to be selected and laid in red mortar. Set a bluestone cap on top with flue holes cut full size. To be neatly axed.

Build in the chimneys the necessary pipe rings, etc., and provide the fireplace openings, as shown, lined with Trenton front brick in red mortar.

Set a 4"×10" bluestone lintel over kitchen fireplace, which will also be entirely faced with Trenton front brick.

Bluestone.—Outside entrance to cellar to have bluestone treads and coping.

Set a rubbed bluestone for kitchen hearth.

Turn trimmer arch of brick under same and under all fireplaces. Furnish chimney caps as above.

Cellar Concrete.—Concrete the cellar bottom with gravel, sand, and Rosendale cement concrete four inches thick, well rammed, and finish the surface with Portland cement.

Tiling.—Tile the hearths of dining room and parlor in mortar of cement and plaster of Paris mixed. To cost, laid, fifty cents per square foot.

Lath and Plaster.—Lath the walls, partitions, ceilings, stair soffits, etc., throughout, except cellar and attic, with sound laths not less than $\frac{5}{16}$" apart, thoroughly nailed, with joints broken every 18 inches.

Plaster throughout to be three coat work. "scratch," "brown," and "hard finish," except closets, which will be two coat. Use clean, sharp sand and good lime mixed thoroughly in proper proportions with long, strong hair.

Hair to be put in after lime is thoroughly slaked, and no mortar to be used until a week after mixing. Plastering to be straight and true, and worked to the grounds.

Run cornices of gauged mortar and white sand in parlor, dining room, and hall of first story, as per detail, and furnish and set centers for same rooms of approved design. Run rule joint moulds on corners of transoms, and provide and set brackets for same. Do all patching required, and clear away all rubbish.

CARPENTER WORK.

Framing and Timber.—Thoroughly frame the building throughout, as required to carry out the plans, with 4"×6" spruce sill, to rest on stone wall, 4×4 corners posts, plates, frames of doors, windows, etc., and wherever else required for additional stiffness or strength. Studs to be 2×4, 16" from centers, with sills and plates same size as required.

All parts of framework to be properly braced and bridged as directed, especially at exterior corners. Girders in cellar to be sizes called for on plans. The first and second story floor beams are to be 3"×8", 16" from centers. Ceiling of second story to be 2"×8" beams, 16" from centers. Floor beams to run from north to south. All to be bridged with 1"×2" cross bridging, two rows in each span, thoroughly nailed.

Main roof rafters to be 2"×6", 18" from centers, footed to plates and well spiked. Ridge poles to be 1½"×8". Valley rafters to be 3"×10". Frame for piazza floor with 2"×6", 16" from centers.

Roofs of bays, piazza, and extension to be of joists as required. Frame down ceilings for same where necessary.

Sills, posts, plates, floor and roof beams, etc., to be securely framed and spiked together.

Second story floor beams to rest on a 1"×6" girt let into studs and spiked.

All inside partitions to have cross bridging.

All floor beams used as headers or trimmers to be 4" thick. Spike the beams well where mortised.

Halve the sills together at corners. Truss over sliding doors and other openings requiring it.

All beams, girders, sills, plates, etc., to be of spruce, and studding of hemlock.

Sheathing.—Sheathe the entire outside of building, walls, and roof with hemlock sheathing boards, mill-worked one side, 1" thick, and set tight and well nailed. Cover with two thicknesses of heavy rosin-sized sheathing paper, lapped and secured thoroughly and kept intact.

Outside Covering and Trimmings—Side up the house as shown on elevations and details with clapboards of pine 5½" wide, laid 4½" to the weather, except gables, tower sides above cornice, and a band around building—omitting rear—of the width of space between first story cornice mould and sill of second story windows, which will all be shingled as per details. Roofs of the two bays to be shingled in same style as sides of

building, but tower and extension roofs and roof of piazza to have uncut shingles laid 5" to the weather. Shingling to be curved out at bottom, where shown, as per details. All hips to be furnished with saddle board shingling.

Corner boards, casings, water table, trimmings, etc., to he 1¼" stuff, and as shown on details. Corner boards 5" wide.

Door and window sills 2" thick.

Piazza posts, rails, balusters, cornices, gutters, etc., all to be as per details, with rafters 3×4 pine under ceiling, which is to be matched and beaded 1×4½" pine ceiling boards. These rafters to be planed smooth and to be of pine.

All exterior covering, trimmings, etc., to be clear, dry white pine. Provide gutters in main and rear extension roofs, same as detail shown for piazza roof, and do everything necessary to prepare the roofs for slating and shingling.

The roof of tower to be curved, as shown, and properly framed as required. To have a scuttle from ceiling of room below. Tower to be square. Properly secure a wooden finial on the peak.

Flash as required in all angles where there is shingling and on the tops of small windows of attic. Also over sill course of second story windows.

Piazza floor to be 1"×4½" tongued and grooved, and mill-worked one side.

Piazza steps 1¼" white pine, risers 1", to have cove mould and nosing and 1½" strings.

Rear stoop risers, treads, strings, and platform of 1" pine; to have plain rail and uprights. Fill under piazza and stoops with lattice work frame, arranged so as to easily remove; slats to be about ½"×2" and 2" apart, strongly nailed together and secure in place. Build a bulkhead over cellar outside steps, with strong batten doors, and fastened with strong hinges, and padlock, etc.

Interior Trimmings, Floors, Doors, etc.—All interior work to be sound, clear, dry white pine, unless otherwise specified.

Flooring throughout, except attic, to be 1"×4½" tongued and grooved, mill-worked one side, and thoroughly blind-nailed. Put down floor in attic of hemlock boards, well nailed down, 1" thick and mill-worked one side.

Grounds.—Put on all grounds required for base and plastering, throughout.

Window Frames.—Cellar, attic, and tower windows to have 1¼" skeleton frames. Remainder of windows, except the small window shown on north elevation, to be box frames, with 1" casings and pulley stiles, ½" parting strip, and 1½"×⅞" stop beads, for 1½" sliding sashes.

All sashes are to be 1½", except those in cellar, attic, and tower, which will be hinged as directed, and 1¼" thick. The others are to be double sliding sashes to each window, except the small window on north side, which will be hinged. Sashes divided for glass as shown.

Windows of cellar, rear extension, bath room, tower, and attic to be glazed with best single thick American sheet glass. The remaining windows of first story to have best double thick French sheet glass. The remainder in second story to have best double thick American sheet glass. Set in putty and fasten thoroughly with metal points.

All windows of house, except cellar and the two bays, are to be provided with 1¼" outside blinds, with rolling slats and strong hinges, and to fasten open and shut. Cellar windows to have strong shutters, hung and fastened.

Door jambs are to be 1¼", stiff rabbeted for doors, and securely put together and set. Blockings to be behind hinges. Provide and hang in windows of the two bays inside blinds 1" thick, of pine, beaded edges, cut once in the height, three folds to each window, except small side windows of front bay, which will be two fold, to hinge from inner side. All to have revolving slats and rods.

Doors.—All doors, except closet, sliding, and front and vestibule doors, to be 1½" thick, four panels, with flush mouldings, both sides. Closet doors to be 1¼", four panel, flush mouldings outside. Front, vestibule, and sliding doors to be 1¾" thick. Front and vestibule to be special design as shown. Sliding doors to be four panel, flush moulded. Vestibule doors to have upper panels glazed with frosted glass, and also the transom over front doors, one light each.

Trim.—Trim to be 4½" wide, 1" thick, mitered, and as per details.

Base to be 1"×8", with rule joint on top throughout. All trim, doors, etc., in parlor, dining room, and hall to be extra clear dry white pine, for finishing in the natural wood. Closet and pantry trim will be 1"×4", mitered at top and run to floor unmoulded. Base for closets ¾"×6". Door saddles throughout to be ash, beveled.

Stairs.—Main stairs to have 3"×3" ash rails (moulded), and pine 6" starting newel, and 4" platform, and second story newels, all turned. To be 1½" turned balusters. Treads to be 1¼", with cove and nosing. Risers 1", strings, fascias, etc., 1¼" beaded.

All to be well timbered, framed, housed, glued, and secured.

Attic stairs to have strings, risers, treads, etc., of 1" and a moulded pine rail up to platform.

To be inclosed above platform with ceiling boards 4½" wide.

Frame cellar stairs of 2" stuff, to have strings and treads. Treads dressed one side. Construct in the first story hall as shown the feature at front of main stairs. Do any woodwork around sink that may be necessary to secure it, and carry up beaded strips 2' 6" higher than sink, and wainscot the entire space between the doors either side of sink to same height. Provide a drain board for sink.

Run a chair rail same section as trim around the kitchen, at height where shown.

All closets are to be fitted up as directed with dry pine shelving, and closets of second story are each to have a row of double clothes hooks on cleats, entirely around closets. Hooks to have flat heads and to be black japanned.

Hardware.—First story front outside doors to have 5" mortise lock, with night latch, brass face plates, keys, etc. Knobs, drop, roses, bell pull, etc., to be of bronzed iron. Fasten on inside with top and bottom bolts, all complete. To be properly hung with 5" loose pin butts of bronzed iron, ornamental face.

First story doors to have 3½" black japanned butts, plain with acorns, and 4½" mortise locks, with brass face plates and keys. Knobs and drops white porcelain, except sliding doors, which will have proper sliding door lock, with pulls, etc., brass face, all complete. To be run on brass track and to have best anti-friction sheaves.

Remainder of doors throughout, including closets, etc., to have 3"×5" rim locks, with white porcelain knobs and drops, and brass keys.

Cellar, attic, and tower windows are to have strong hinges and buttons. All double hung sashes to have cast iron weights, best noiseless pulleys and best hemp cord, and proper sash fastenings, as selected.

Inside blinds to have brass butts, shutter bars, and knobs, complete. Outside blinds and shutters to have strong hinges and catches to fasten open and shut. Hearth borders for parlor and dining room to be ash, well nailed down.

Fit up a 4" gong in kitchen, to ring from front door, with pull, wires, etc., complete.

Mantels will be furnished by other parties.

Wainscot the bath room with matched and beaded strips 3" wide, ⅝" thick, tongued and grooved, with suitable cap. Case around bath tub, wash basin, and water closet, and do all fitting up required to make these fixtures complete. To be arranged so water closet front can come apart readily, and to be door under wash basin.

Fit up a coal bin in cellar, with strong plank and studs, with door opening and sliding boards that can be removed at will.

Set four turned chestnut clothes posts with cross pins in yard, where directed.

All exterior plaster angles to have 1¼" turned angle beads. Do all necessary cutting and fitting for and make good again after other workmen.

Provide two scuttles for roof, with hooks, etc.

Ceil up under the main stairs so as to close off the main hall from the cellar stairs, and case the outer partition where it shows on cellar stairs. Fill in pieces between the studs at first and second story floors so as to cut each story completely off from the one below. Set a 3" roll on roof ridges for attaching metal.

Build an outside privy house, 4'×6', with strong frame of studs, with sills, plates, and rafters, and sheathe and clapboard the outside, using sheathing paper. To have corner boards and water table, and roof to be shingled on sheathing boards and paper. To have batten door with fastening latch, and seat to be arranged with two large holes and one small, on different levels. Seats to be of 1¼" stuff. Provide two sliding sashes.

Slating, Tinning, Flashing, Leaders, etc.—All roofing to be done over best rosin-sized sheathing paper as before specified. Cover the main roofs with best selected dark blue Pennsylvania slates, 10"×20" and 8" to the weather; slates to be of good, even thickness, straight, and thoroughly nailed with galvanized nails.

Provide and work in the necessary flashings on chimneys, valleys, angles, etc., for all roofs, of zinc. Tin all the gutters with heavy tin in small sheets, properly lapping and protecting, and running the tin well up under the slating and shingling. Paint the tin work two coats of paint both sides. Tin two scuttles and flash around them. Provide and set heavy ridge cappings of zinc, with 6" lap on slates.

Form a gutter and do all trimming and flashing around tower that may be required, including finial. Flash over the tops of attic windows and along over the course running level with second story window sills with tin, also the short cornice returns in gables.

Provide, set, and connect leaders from piazza, rear extensions, and main roofs. Those for piazza and extension, to be 2" round. The remainder 3" round, to be as may be required to properly connect the gutters. All to be thoroughly secured and connected and of galvanized iron, with galvanized basket protectors at leader heads. Where leaders connect with cast iron pipe, put in a valve that can be operated to turn the water into the cistern or not, as may be desired.

PLUMBING.

Drain Pipes.—From the tiled rain in yard carry into house a 4" cast iron drain to receive waste from fixtures, and to be carried up above roof and capped. Leave Y branches at first and second floors and another 3' above fixtures in second floor for receiving back air pipes. This drain pipe is to be trapped at base before leaving the house with movable cap for cleaning purposes.

Drain to be well tarred, and to be secured with hooks and rests as required. Joints to be thoroughly calked with oakum and molten lead. Connect lead and iron pipes with brass ferrules, joints well calked, soldered, and "wiped."

Pump.—Furnish and set in kitchen a Champion No. 1 horizontal double acting suction and force pump, with copper chamber.

Connect with pump and carry to bottom of cistern a 1¼" heavy lead suction pipe, pierced with holes at end, to have air cock.

Supply Lines.—Carry from pump to bottom of tank a 1" galvanized iron pipe, with stop and waste to run into kitchen sink, so as to empty the lines above, and to supply the sink direct from pump when desired. Supply lines to fixtures, to be ⅝" galvanized iron pipe. Grade the pipes so as to drain out.

Tank.—Furnish and set in attic a strong tank 4' × 4' × 4', and line with 16 oz. tinned and planished copper, with proper inlet and outlet connections.

Connect overflow of 1¼" lead waste and run to kitchen sink.

Boiler.—Furnish and set in kitchen a 30 gal. iron boiler on iron stand, supply through ⅝" galvanized iron pipe, with stop and waste cock, and provide sediment cock for emptying boiler.

Fixtures.—Fit up in kitchen a cast iron sink 1' 4" × 2' 4", with strainer. Supply with hot and cold water through brass flange and thimble cocks, with hose nozzle on cold water cock. Cocks to size of supply pipes.

Waste sink through 1½" lead waste pipe and strap with screw.

Water Closet.—In second story bath room fit up an Ideal washout closet, with square bowl and hand opening for cleaning purposes. Waste water closet through 4" heavy lead waste and strap with screw into cast iron drain.

Furnish and set a copper-lined cistern for water closet with automatic valves, ball cock, after wash, etc., complete, suitable size, and make the necessary connections for flushing water closet through 1¼" D lead pipe, and for supplying cistern from upper tank.

Discharge an overflow pipe from water closet cistern to the bowl of the water closet.

Bath Tub.—Furnish and fit up in bath room a bath tub of 16 oz. tinned and planished copper, 5 feet in length, with overflow and nickel plated combination cock, plug, chain, strainers, etc. Waste through 1½" lead pipe and S trap with screw.

Wash Basin.—Furnish and set in bath room a patent marbleized 12" wash basin, with overflow, and fastened with brass clamps to a countersunk Italian marble slab, with base.

Supply basin with hot and cold water through nickel plated swivel basin cocks. Waste through 1¼" lead pipe and S trap, with screw and nickel plated plug, chain stay, and strainer.

Back Air.—Connect all traps with 1½" lead pipe, and carry to a point on the soil pipe 3' above the highest fixtures.

C. I. Leader.—From a point 3' 6" above ground carry to cistern a 4" cast iron drain pipe, which is to receive the rain water leaders, and is to be calked with oakum, and joints filled with molten lead well hammered in.

Safes.—Under water closet, bath tub, and wash basin provide lead safes, with edges turned up and drained through ¾" lead pipe to cellar.

Range.—Furnish and set in kitchen a Beebe range, and make connections with boiler through ¾" lead pipe.

Heating.—Furnish and set complete a portable furnace, size, make, etc., as will be directed. Carry from furnace to registers, with pipes of indicated sizes and where shown on plans, set in partitions having valves near furnace and with register boxes and black japanned registers, with valves, etc., complete, the sizes called for. Set in plaster of Paris. Connect properly with smoke flue, and leave everything complete.

Cover over the pipes in partitions with metal, lath both sides, and thoroughly secure and leave ready for plastering.

PAINTING, VARNISHING, ETC.

All exterior wood work and metal work is to be given two coats of best linseed oil and white lead paint, colors, etc., as may be directed. All wood work of parlor, dining room, and hall to receive two good coats of oil and two of spar varnish. The remainder of interior wood work is to be painted two good coats

of best linseed oil and lead paint. Putty everything up thoroughly and sandpaper and rub down as required

First coat to be put on the outside as soon as possible after the wood work is up.

IN GENERAL.

All work and materals to be the best of their several kinds.

The drawings and specifications are supplementary to each other. Anything shown in one and not in the other must be done as though fully drawn and specified.

The contractor is to supply all labor and materials necessary to properly complete his branch of the work, unless otherwise herein specially excepted, and is responsible for and must deliver up his work perfect at completion.

He is to remove all rubbish caused in carrying out his work.

The following is our estimate for the above house:

Framing, raising, and sheathing	$580.00
Clapboarding, belts, cornices, etc	490.00
Lining gutters, slating, leaders, and flashing	190.00
Piazza, back stoop, cellar door, and lattice	240.00
Plumbing	345.00
Flooring and partitions	145.00
Stairs	130.00
Sash, doors, and blinds	355.00
Trimming	260.00
Hardware	96.00
Total	$2,531.00

MICKENS & BYRAM,
Carpenters and Building Contractors,
Newark, N. J.

A LARGE BUILDING ENDANGERED BY DRY ROT.

The large and splendid apartment house known as Holbrook Hall, located at the corner of Fourth Avenue and Sixty-second Street, New York, was lately discovered to be in an unsafe condition, owing to the presence of dry rot in its wooden joists. We give an engraving of the structure, which was erected about four years ago, in first class style, at great expense. It is eight stories high and one hundred feet square.

With a view to protection against fire the joists were covered and inclosed with cement—a fatal mistake. It is well known that wood when thus inclosed, and access of air prevented, will decay, and the rot will more rapidly progress if the wood be green or unseasoned. Such is believed to have been the case in this instance. The joists were of hemlock.

The early discovery of the dry rot in the timbers was due to a slight fire which broke out on the upper story of the building, which burned the floor and exposed the timbers to view. It is believed that the entire building will have to be taken down. It was considered to be in danger of falling at any moment when the discovery was made, and all the families in occupation were at once obliged to vacate. The order to leave was given in the evening, and the tenants took refuge in neighboring hotels.

The Trade Unions.

In Middletown, N. Y., a Mr. Smart undertook to build a factory, and hired bricklayers and masons. A part of the work consisted in the construction of melting furnaces for glass, and Mr. Smart, being thoroughly familiar with the proper mode of laying the firebrick around such furnaces, and wishing to have this important part of the masonry done in the particular manner that he preferred, took up a trowel and began to lay a few bricks. Immediately an uproar arose among the masons and bricklayers, who informed their employer that they would not work with a "scab," meaning himself, and threatened to strike in a body unless he laid down his trowel at once.

In another case, a walking delegate of the Carpenters' and Joiners' Union was brought into court in New York, charged with having deprived Robert Hoff, a journeyman, of work. It had appeared that Hoff had belonged to the union, but had for some reason incurred a fine, which he refused to pay. He was thereupon expelled from the union, and the walking delegates were set upon his track to persecute him. He was at work in a large shop in Twenty-eighth Street, where the delegate found him, and his employer was notified to discharge him, under pain of having all the rest of his men called out if he refused. He resisted for some days, but was at last compelled to ask Hoff to give up his work until the matter could be adjusted, and Hoff thereupon entered a complaint against the delegate. The case was called before Judge Gorman, who explained the law of New York to be that a walking delegate had no right to go to an employer and threaten to deprive him of his men unless he would discharge a particular workman, although the delegate had, as he said, "a perfect right to go among the men belonging to his union, and arrange with them to stop work."

PUTTING WATER HEATING PIPES IN COOK STOVES.

Most first-class cook stoves are so arranged as to admit of a water back or water front, which in most cases is made of cast iron, and hollow. Two pieces of water pipe are screwed into the back, one over the other, so when the cold water goes into the back through the lower pipe and becomes heated, it will go out through the upper pipe. Many of the cheaper stoves are not provided with water backs, nor are there any holes in them for the inlet or outlet pipes; so when such a stove is to be fitted for heating water, the holes have to be made, and gas or water pipes put in to heat the water, unless a cast iron water back made for some other stove can be used, which is seldom the case.

To make the holes in the stove for the pipes, mark the size of the pipe on the stove, in the proper location, then drill holes around the inside of the circle, so the piece can be knocked out without danger of breaking the casting. The hole can be made round by filing out with a half-round file of proper size.

Fig. 1 shows the general shape of a heating pipe for

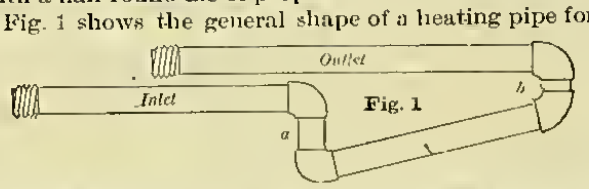


Fig. 1

an ordinary cook stove. The piece *a* is longer than *b*, so that the water, as it becomes warm, will be rising.

The outlet pipe should always be on a slight incline, as it is more natural for hot water to go up than down. Crooks in the pipes should be avoided, as they form air or steam traps, which prevent the water from flowing.

The water pipes should be so located as not to interfere with the oven door, or be in the way of the articles that are to be set in the stove holes.

Fig. 2 illustrates the manner that the pipes should

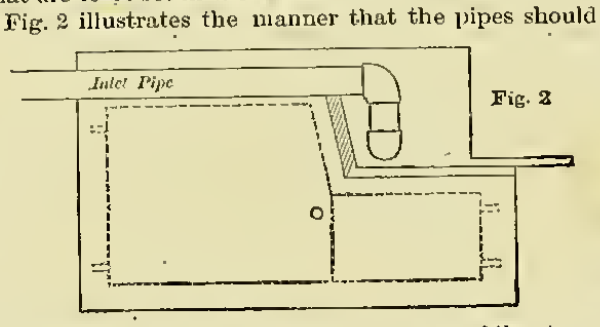


Fig. 2

be located in reference to the door and top of the stove. The pipe in this drawing is too large in proportion to the fire box. In most cases the two elbows at *b*, Fig. 1, should not be more than an inch apart.

Some stoves are made so there is not room for the pipe to go inside the stove to reach the fire back; then it must be put outside and above the oven door, B, Fig. 3. When there is room, it can go as shown by A.

Three-quarter inch gas pipe is usually large enough; put once through the stove. When much water is to

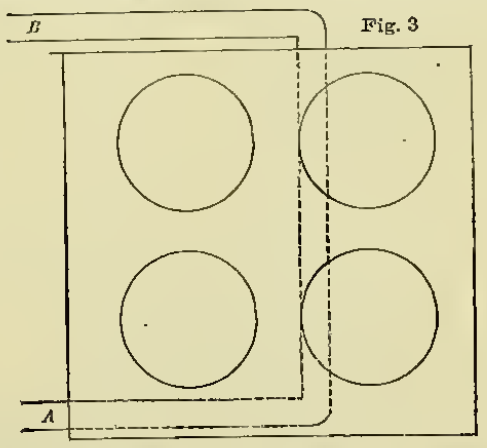


Fig. 3

be heated, it may be necessary to make a "return." If the back of the stove, or rather one side of the stove, sets against the wall, so the oven door is not used, the inlet and outlet pipes can be on that side or back. Most stoves are so located that their position will indicate the location of the pipes.

The main point to be observed in putting in such work is, have the pipes so arranged that the water will, from the time it leaves the coupling under the water tank, be going up an incline, and never under any circumstances try to make hot water go down hill until after it has become heated. As the cold water is supposed to be becoming warmer all of the time, it should have an upward tendency.—*Amer. Artisan.*

Cedar Shingles.

In view of the rather short stock of pine shingles in the Northwest, it appears a little singular that there is not a better demand and a better price realized for cedar shingles. These shingles have been in market a long time, but it is to be confessed that they make but slow progress. They do not sell as readily as pine, and they do not bring quite the same price, yet they are better shingles beyond a doubt. Men of experience in the business are puzzled that these superior articles to be had at a lower price do not take the place of more pine shingles that, costing more, do not answer the purpose so well, and are not nearly so durable. It is possible that the fact that cedar shingles are cheaper than pine may have something to do with their comparatively smaller sale. With a good many consumers the only guide to value is the price, and they would be very likely to infer from the fact of the uniform difference in the cost that there is a corresponding difference in the actual value. And probably another reason why cedar shingles are not more popular is that in many districts they are practically unknown. It is conceded that the white cedar of the North produces a shingle that cannot be surpassed, even by the Southern cypress. As a roofing material it is infinitely superior to pine, and where its merit is once appreciated, there is very little sale for the latter. It is only a matter of making consumers acquainted with a knowledge of its good qualities and its perfect fitness for the purpose to greatly increase the demand and materially improve the price.—*Timberman.*

Some Data on Steam Heating.

The following data on steam heating, taken from my note books, cover some points which were arrived at in the course of professional practice, and which have stood the test of years of special experience.

When the direct system is used to heat buildings such as abound in our great cities—buildings in which the street floor is a store and the upper floors are devoted to sales and stock rooms and to light manufacturing, and in which the fronts are of stone or iron, and the sides and the rear of building of brick—a safe rule to follow is to supply one square foot of boiler heating surface for each seven hundred cubic feet, and one square foot of radiating surface for each one hundred cubic feet of contents of building.

For heating mills, shops, and factories, one square foot of boiler heating surface should be supplied for each four hundred and seventy-five cubic feet of contents of building, and the same allowance should also be made for heating exposed wooden dwellings. For heating foundries and wooden shops, one square foot of boiler heating surface should be provided for each four hundred cubic feet of contents, and for structures in which glass enters very largely in the construction—such as conservatories, exhibition buildings, and the like—one square foot of boiler heating surface should be provided for each two hundred and seventy-five cubic feet of contents of building.

When the indirect system is employed, the radiator surface and the boiler capacity to be provided will each have to be, on an average, about twenty five per cent. more than where direct radiation is used. This percentage of twenty-five also marks approximately the increased fuel consumption in the indirect system. When the overhead system of steam heating is employed, in which system direct radiating pipes, usually one and one-quarter inches in diameter, are placed in rows overhead, suspended upon horizontal racks, the pipes running horizontally and side by side around the whole interior of the building, from two to three feet from the walls and from two to four feet from the ceiling, the amount of one and one-quarter inch pipe required, according to Mr. C. J. H. Woodbury, for heating mills (for which use this system is deservedly much in vogue) is about one foot in length for every ninety cubic feet of space. Of course, as Mr. Woodbury points out, a great range of difference exists, due to the special character of the operating machinery in the mill, "both in respect to the amount of air circulated by the machinery and also the aid to warming the room by the friction of the journals."

Prof. Charles A. Smith gives the following data for the relation between radiating surface and cubic contents as representing the results of the practice of the Dubuque Steam Supply Company, Dubuque, Iowa. He says: "We find that with the external air ranging to 0 degree Fahrenheit, one square foot of heating surface warms a number of cubic feet, as follows, in columns two and three:"

Class of Building.	When heaters are in same rooms (direct system), cubic feet per square foot.	When heaters are in basements (indirect system), cubic feet per square foot.
Dwellings	50	40
Stores, wholesale	125	100
Stores, retail	100	80
Banks	...	...
Offices	70	60
Drug stores	...	...
Dry goods	80	70
Large hotels	125	100
Churches	200	150

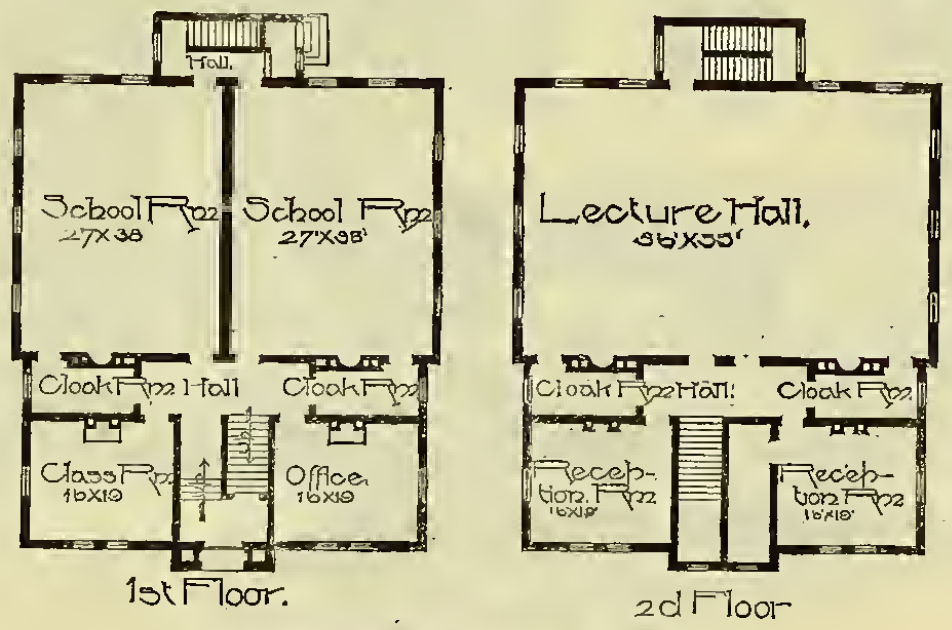
For determining the cross sectional area of pipes (in square inches) for steam mains and returns, it will be ample to allow a constant of 0·375 of a square inch, plus, for each one hundred square feet of heating surface in coils and radiators, 0·375 of a square inch when exhaust steam is used, 0·19 of a square inch when live steam is used, and 0·09 of a square inch for the return. If the cross sectional areas thus obtained are each multiplied by one and three-elevenths, and the square root extracted from each product, the respective figures obtained will represent the proper diameters, in inches, of the several steam pipes referred to.—*A. R. Wolff, in Stevens Indicator.*

SCHOOL HOUSE ARCHITECTURE.

LOUIS H. GIBSON.

The problem of building a school house in a Western settlement which is new, where money is scarce, is a different thing from building a house for school purposes in a State like Massachusetts or New York or other Eastern States. They both want school rooms, they want light and air and a certain convenience. These things belong to both of them in common. The Western school house must be built with a small sum of money. In the first settlements it is a temporary affair. It is not a very comfortable place to be in winter, and altogether has a barren, unsatisfactory look. Yet it is a school house, and serves its purpose. In the course of years that community becomes more wealthy. They get a little money together At the same time that there is more money there is a greater number of scholars to be taken care of. In some instances the development in this respect is in excess of the money supply, in which case the quality of the school house architecture suffers. If we take a locality like Indiana or Illinois, we have a medium condition. They are populous sections, and the wealth is increasing. We are in a condition to build a good deal better house than we did a while ago, and we have to build a great many of them, however, because of the rapid increase of population. But while we are in a position to get all the comforts which may belong to a school room, we can have none of the luxuries. The building must be plain and substantial, it must be well ventilated, and due care must be taken for the comfort of those who constantly occupy it. But on the outside, there is no opportunity for any large expenditures of money. Still, it does not do to have a building offensive to good taste. It is to be noticed that in the buildings throughout this section there is a certain amount of barrenness in their appearance. They look large and in some instances a little clumsy. This is the result of necessary economy, not that good taste and large sums of money naturally go together, but in the effort to save money, which must always be uppermost in the thoughts of those who build school houses, the economy sometimes descends to parsimony, and taste suffers. A good-looking house of any kind is not so much a matter of money as it is a matter of wit. One can put ever so much money in a school building and still have it clumsy and awkward and positively ugly, or he can put in a small amount and properly dispose of the material at hand, using intelligent thoughtfulness in the matter, and a good-looking building may be devised. It takes more thought and more ingenuity to get a building that is presentable for a small sum of money than it does for a larger sum.

In the plans which we are about to give, the idea of utility at a low cost will control everything that is done. At the same time, we will endeavor to give a building which will look well and be generally satisfactory to those who come in contact with it.



SCHOOL HOUSE ARCHITECTURE.

The house which is here given is one which is located in a country town, and for which reason it is somewhat different than what it would be if in a larger city. The audience room on the second floor is something which does not belong to the school houses which are built in cities, where audience rooms, lecture halls, etc., are afforded in other buildings. It would be entirely possible to have the second story arrangement of this building exactly the same as that of the first, in which case it would be a four-room house with the attached recitation rooms.

The rear projection affords an exit to the rear from the audience room, and might not be thought necessary in case of the use of the upper part of the building as school rooms. Altogether, it is questionable whether it is necessary in this instance. However, this was the way the house was built, and as indicating a practical fact it is given in that way. The stairway which would be regularly used would be the one in front.

The cost of this house would be between $8,000 and $9,000. The contract has been awarded on that basis.

In the matter of the cost of school houses or buildings of any kind, it may be said that it will vary in different parts of the same State or the same county. The cost of material and labor has a good deal to do with it, and then the matter of business management controls it very largely. One man or one set of men may be able to build a house cheaper than another because they give it more attention, or more intelligent attention. And while the estimates that are given by this journal for the plans which it will present are correct, we do not pretend to say that everybody will be able to build a house at the cost that we give.

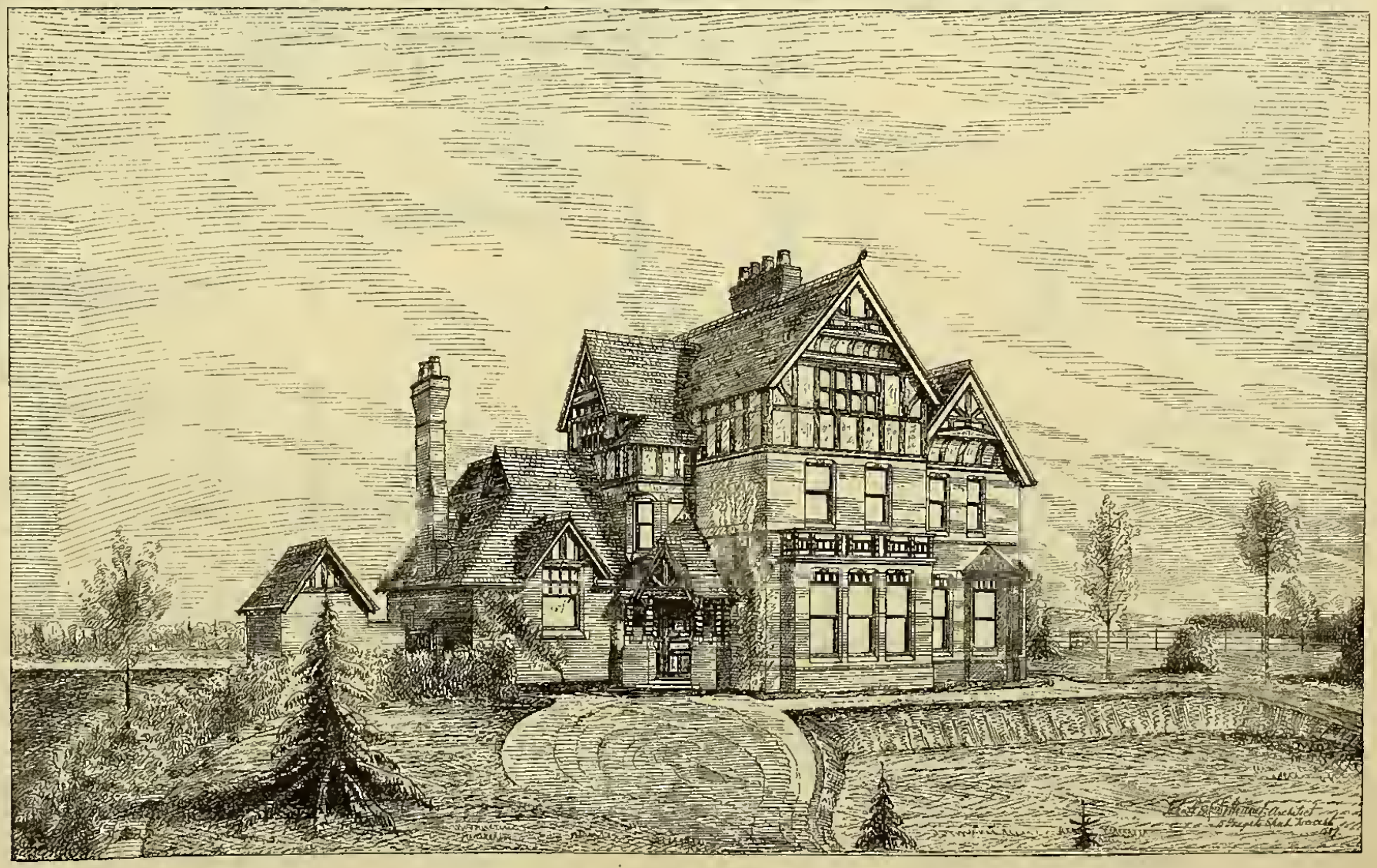
It may not be necessary to say that this building is of brick, as the drawings will indicate that. It has the slate roof, with galvanized iron copings and a tin deck on the top. The finish on the inside is of hard wood. The floors are deadened. The foundation is of stone. It is thoroughly well built.—*Trustees' Trade Journal.*

A RESIDENCE, BATTENHALL PARK, WORCESTER, ENGLAND.

This house has recently been erected for Mr. James Hayes on a large piece of elevated ground forming a portion of the Battenhall Park estate, which lies to the southeast of the city of Worcester, and forms one of the best positions in the vicinity for the erection of first-class private residences, being very high and dry, and commanding splendid views of the Malvern Hills and surrounding country.

The house contains spacious entrance and staircase halls, with the usual reception rooms approached therefrom, with kitchens and offices on the north side. On the upper floors are five bed rooms, bath room, water closet, and housemaid's closet, with a good supply of storage accommodation, the principal staircase, of pitch pine, two stories high, being a central feature.

The building is of red brick, with Bath stone strings, heads, sills, and ashlar bands to relieve the same, the gables being finished in "half-timber work" and rough cast, and the roofs covered with Broseley tiling.—*The Architect.*



A RESIDENCE AT BATTENHALL PARK, WORCESTER, ENGLAND—JOHN HENRY WILLIAMS, ARCHITECT.

A DWELLING FOR $4,500.

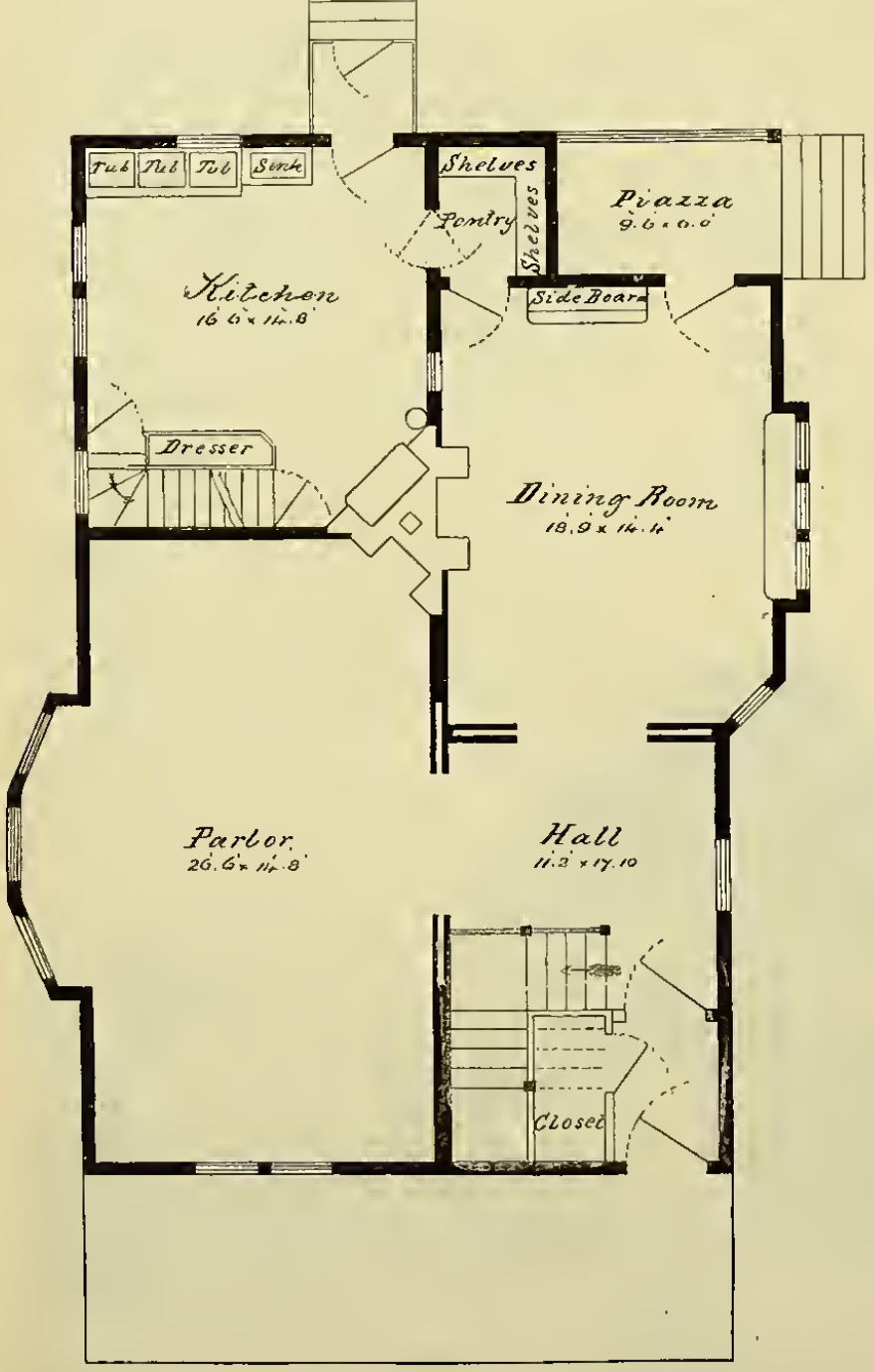
Size.—Front, 30 feet, exclusive of bay windows; side, 44 feet, exclusive of piazza; for size of rooms, see floor plans.

Materials.—Foundation, 12 inch brick wall; first and second stories clapboarded up to the top of the second story windows; shingles from the second story windows up to the roof.

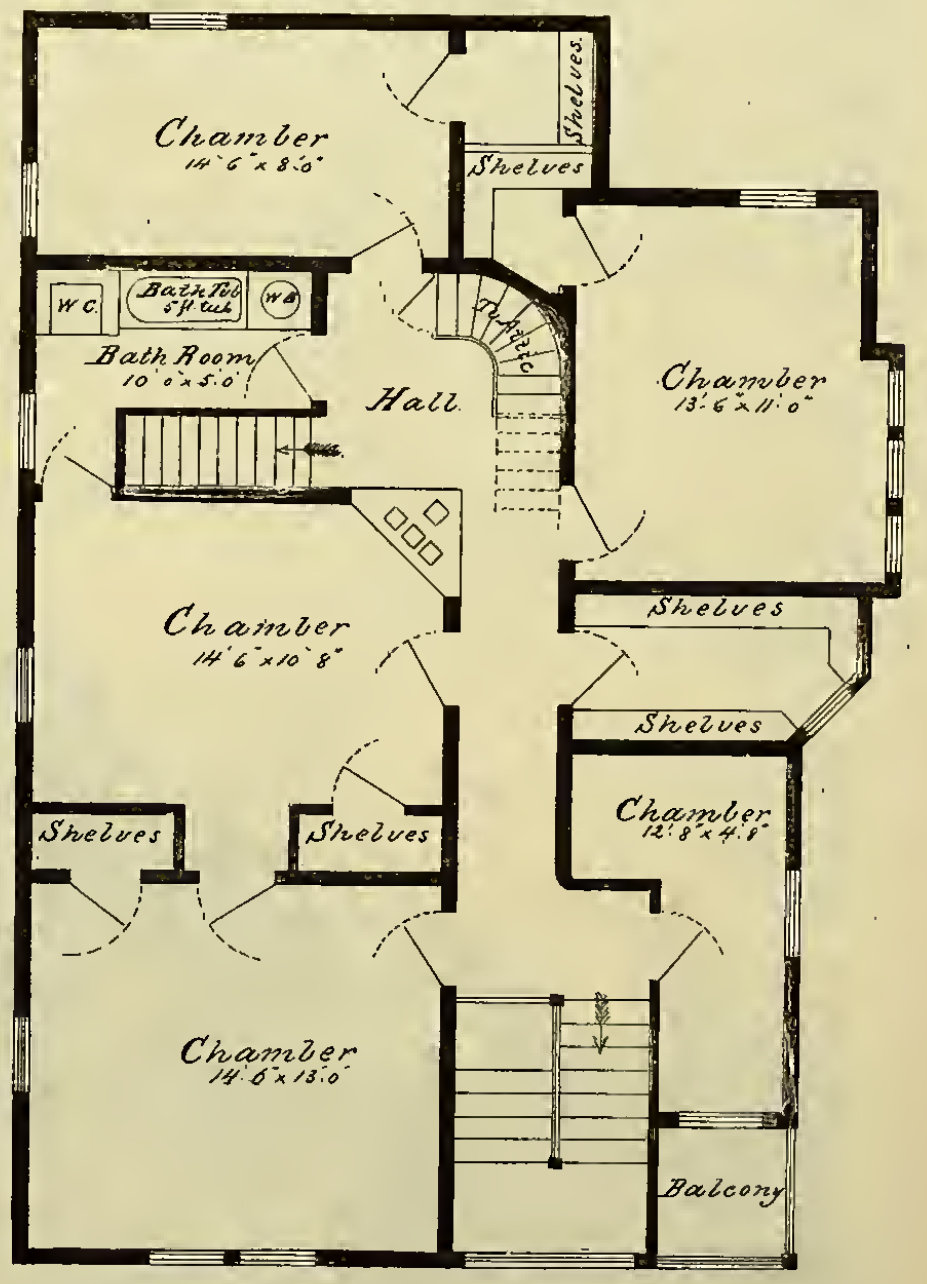
Height of Stories.—Cellar, 7 feet; first story, 10 feet; second story, 9 feet; attic story, 8 feet.

Cost.—$4,500, complete, with plumbing; furnace, etc.

Special Features.—Sliding doors connect parlor, hall, and dining room; attic entirely floored over, and three rooms can be finished therein. Cellar under the whole house, with cemented bottom.



First Story Plan.



Second Story Plan.

A DWELLING FOR $4,500.

AN ORNAMENTAL PAVILION.

At the recent Federal Shooting Festival, Geneva, Switzerland, several ornamental platforms of temporary character were erected for the accommodation of committees and guests. From these we select the drawings of the reception pavilion, as given in *La Construction Moderne*. The architect was M. Juvet. It is a graceful structure and not expensive. Architects and builders may derive useful suggestions therefrom, if called upon to erect anything of this kind for fair grounds.

Plastering.

Persistent efforts are being made in nearly every branch of building toward better and more durable work, and the percentage of better work is increasing accordingly.

About the only part of a building that seems given up as hopeless is the plastering, yet the importance of plastering is rated in the mind of the architect and builder very much lower than the facts justify. Plastering may be described as the substance which bounds three-fourths of the space of our rooms. A successful job of plastering furnishes a better material for finishing rooms from a sanitary standpoint than anything short of metal or glass. It can be applied without joints and at a far less cost than any other substance at all fit for the purpose.

Good plaster is in fact a good artificial thin stone wall without joints and as cheap as the paint on woodwork. It can be modeled and colored cheaply. These qualities have made it a necessity, yet it is a fact that architects insist less upon care in the selection of its materials, and skill in their application, than upon any other finish in the building. Let us look a little into the causes of failure. Of the many materials in use, sand and quicklime are most important. A pretty pure lime is generally used in preference to a lime containing much clay or magnesia. Good quick or fat limes are not hard to get in these parts, and because of their bulk and fineness when slaked they are much cheaper than other sorts.

The sand, it is believed, must be angular and clean, both of which notions are certainly borne out by practical tests. The sharpness of sand may be judged by the aid of a lens after a little experience. Not so its cleanness. Probably a very clean sand of good form will always do its part toward furnishing good mortar, but what constitutes a clean sand is somewhat hard to say. That which is loamy would be rejected by any good builder without question, but there is pit sand, plenty of it, that would be chanced in plastering mortar without question, and from which good mortar is never obtained.

The sand is free from loam and clay apparently, and yet some natural process of percolation perhaps has coated the grains of sand so that a good mortar is never obtained. In Minneapolis we are so accustomed to indifferent mortar from our pit sand, that we take poor mortar as a matter of course, unless surprised some time by a success outside of town, where we now and then find that, by the use of the same lime used at home and a local sand, we get better work than we receive at home. As it is only after several months' exposure to the air that lime mortars become fully carbonated, and get their consequent hardness and strength, there is doubtless a considerable proportion of out of town work which proves superior to that at home, and is unobserved by architects and builders, they having left the work before it has nearly reached its ultimate hardness. So far as the writer has taken the testimony of close observers, they agree that the mortar of plastering here is inferior to that of many other places observed, and often to that of other localities not far distant, where the same lime was used. That the sand is the chief sinner is shown again by the fact that some of the fine white sand underlying the blue rock gives often a harder brick mortar than is obtainable from the pit sand. These local pit sands are not extremely sharp, yet they are not so noticeably defective as to give rise to objection on that score.

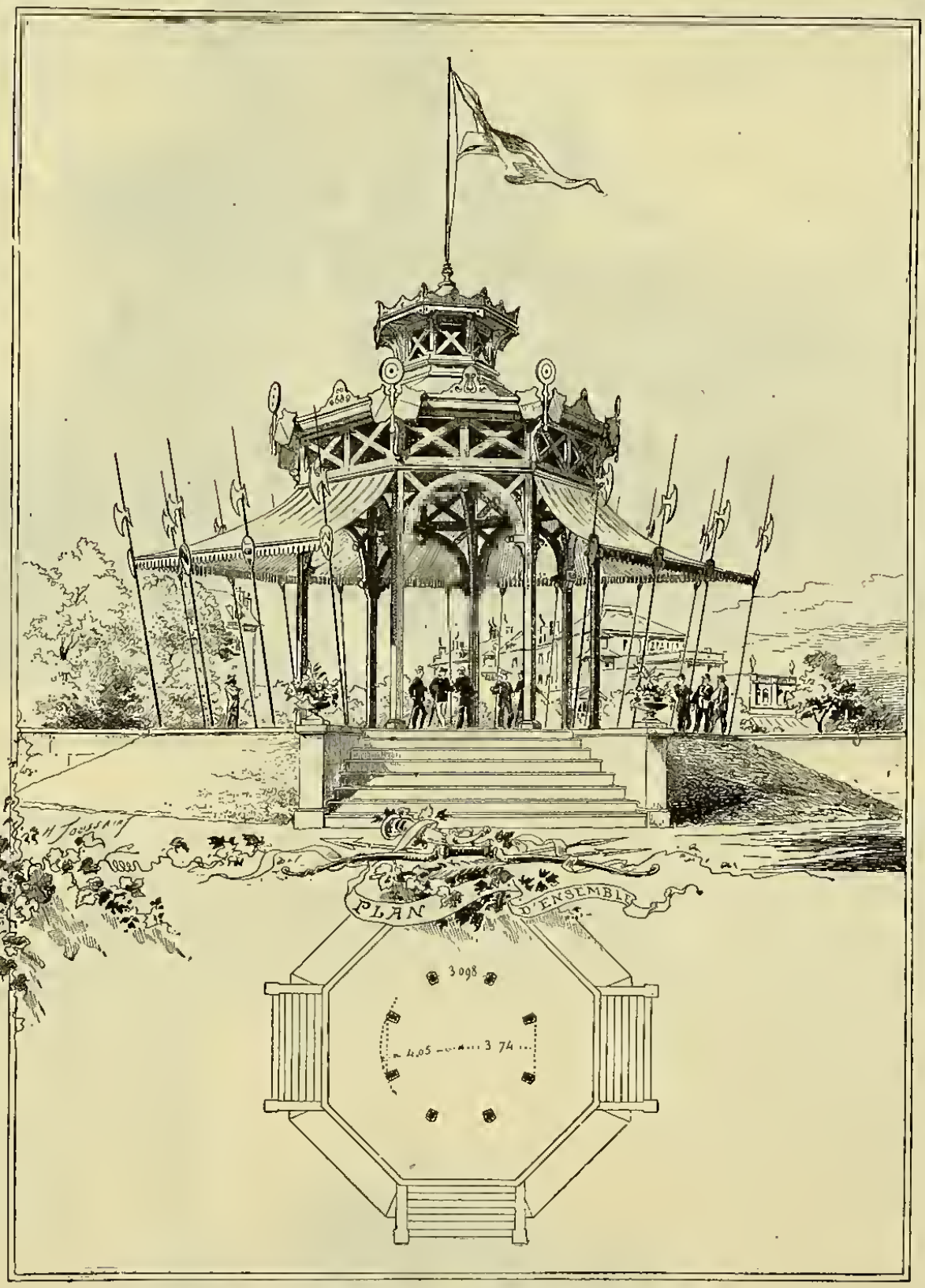
It is probable that very thorough washing of the sand would help, to some extent. Perhaps some simple expedient, such as adding a little acid to the water used in washing, might help.

Of course a large proportion of plaster cracks are due to shrinkage of timbers, but these and cracks due to settling are easily distinguished from those cracks which usually form one or more series and chase everywhere over the plaster, in some cases over plaster on brick walls. Again, we have a vast amount of plaster that never acquires suitable hardness, indicating with its lack of toughness an unsatisfactory chemical combination of the parts, in fact, very indifferent mortar, which is the rule with our plastering.

Mention of hair has been omitted above because any one is supposed to know when the mortar has sufficient to help the first coat to clinch properly, and it is supposed to perform no function except a mechanical one.

Sulphate of lime is sometimes substituted for lime in the first coat and sand in the last coat. It is doubtful if as strong mortar is obtained as when fat lime is used for the first coat, but the plaster of Paris sometimes admits of working at a season when frosts would injure quicklime mortar.

It will be remembered that a few years ago quite a furor was created over "stucco" plastering, and many thought some new discovery had been ushered in. One season of it proved enough. The sulphate is quite commonly mixed with common lime "putty" and troweled on for the last coat, but a last coat of fat lime and sand is certainly much harder ultimately.



RECEPTION PAVILION, GENEVA—M. JUVET, ARCHITECT.

More care should be taken with the backing or support for plastering. A large percentage of it is necessarily applied to laths of some sort. If of wood they form a much better support on timbers of twelve inches than of greater spacing, because of greater stiffness, enabling the float to make the plastering compact—a quality which cannot be overrated.

Lathing should be properly spaced to secure good clinches and fastened with larger nails than is common. Break joints as often as every third lath.

It lies with the architect to see that the timbering is properly joined, and so arranged as not to permit unequal shrinkage.

There is no longer any question about the value of some of the "sheathing laths" or matched boards grooved with "dovetail" shaped grooves. They have passed the probational stage successfully. They offer much better opportunity for "clinch" than do the common lath, their shrinkage is not such as to crack the plaster, they stiffen the walls or ceilings to which they are applied, and while they are of considerable warmth they also prevent breaking through the walls, and on ceilings often prevent staining through. Cracks are much less frequent in plaster applied to these "sheathing lath" than on the common laths.

Stains due to wood laths will not occur if the first coat or coats be heavy and well dried before the finishing coat.

Metallic laths are now to be had in considerable variety. The plain iron should not be used in exposed positions unless plastered on the back side too with a coat of fat lime mortar to protect from destruction by rust. In ordinary positions a coating or dipping in a thin paste of fat lime would be a good enough protection, but for sites greatly exposed to moisture give me the galvanized metal. The wire lathing furnishes excellent "clinch," but in some systems wants stiffness.

Corrugated lathing is made which has the requisite stiffness, but falls short of the wire in the matter of clinch. It much more than makes up for this, however, in greater stiffness and the lateral support it gives to individual timbers. In clinch and stiffness both it is far superior to wood lath.

The surface of plaster formerly received a larger share of attention than now, and scarcely anything about modern building is more to be regretted than the present practices of coating with colored washes put on with animal matter as a vehicle, or covering with paper attached by an easily decaying vegetable paste.

These kalsomining colors are very inferior in effect, and the glories of wall paper never strike people of good taste favorably. From a sanitary standpoint, both are abominable. Imagine a hospital ward on a hot, moist summer day with kalsomined or paste and paper covered walls. We have an inheritance of great value in the knowledge of how those who have gone before did those things.

Moulding within reasonable limits is excellent, but was so overdone when last the mode, that it recovers its true position with difficulty. Something akin to sgraffito decoration might be done with good effect, but would require workmanship of a high class. Coloring in the finishing coat has been done with a considerable degree of success. The effect is not brilliant at all, but when left from the float a very pleasant effect is obtained. I have never seen coloring effectively used in a troweled coat. It seems to be dragged along unevenly by the trowel. Among the earliest methods of treatment of plaster was what centuries later the Italians christened fresco—good fresco. This consisted in coloring the freshly laid plaster with water

colors. The plaster in drying crystallizes the color with itself, so to speak, and the color will not wash off except with enough friction to wear into the surface of the plaster.

The important things in all of this coloring in the last coat or on the surface are two :

1st. Have lime slaked some months before using, and keep in paste form under water or otherwise sealed from the air. 2d. Use substantial mineral colors—ochers, siennas, iron oxides, cobalts, etc.

For surface coloring light tints are obtained by the use of slaked fat lime. Some of the natural cements might be used with advantage in mixing some colors. For rather simple wall coloring, such as will permit finishing a room in one day, for instance, this surface method has but one drawback, and that is the carelessness of workmen who come after and finish the room in woodwork, etc. They have no respect for plastering, and expect it to be patched up after them ; and the colored plaster meets with hardly more respect than the common hard finish. The effect of these "fresco" colors if skillfully laid on is very superior.

This fresco process is honored with a great history, and has preserved to us about all the knowledge we have of ancient painting. Vitruvius wrote that colors applied in this way would last forever, and the work of the buried cities near Vesuvius seems to bear him out. It obtained down to the time of the Italian masters, much of whose pictorial work was done in fresco. Some of them, however, "retouched" with "distemper," the vehicle being white of egg, and as a result now and then a "high light" becomes a black spot.

The Germans now use a modification of fresco which doesn't require the work to be finished while the plaster is still wet, as the whole is treated after decorating with a "liquor of flints"—probably a soluble potash silicate. If a little divergence may be permitted here, it will be made use of to note that experiments with the silicates, or with it and chloride of calcium, as used by Mr. Ransome, of artificial stone fame, might result in greatly hardening the plaster.

Another method of coloring which is probably surest of good results is the encaustic, or the use of melted wax as a vehicle—in old times melted in by heat, but now applied in a solution of spirits of turpentine. It is not very likely that this may be accomplished cheaply, however, unless we take into account the greater certainty and better results.

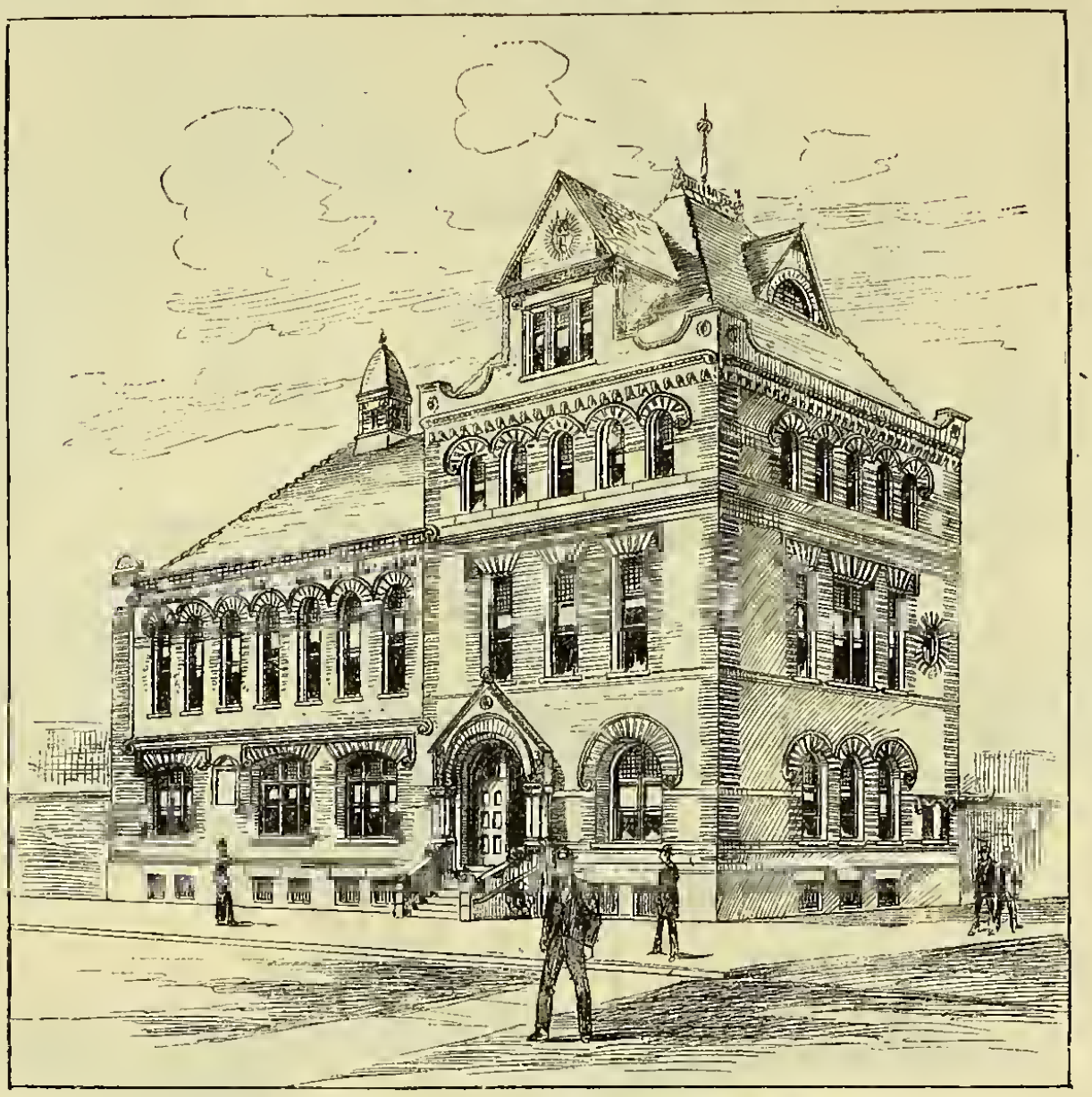
Oil colors being a method of decorating common to all sorts of surfaces, are only referred to here by way of comparison, and to note special difficulties which they present. They are not cheap, as a large amount of stock is required for use in plastered walls ; and the effect is not good compared with either of the above processes. Certain "sizes" are valuable preludes, as preventing the absorption of so much stock by the plastering, and on freshly laid plaster an application of mild acid is said to hasten a condition favorable to the reception of oil colors.

Combinations of modeling of the surface of plastering and of color have given us the great glories of the Alhambra. Combinations of modeling and carving in plaster are strictly in order.

In fine, there is no branch of building more worthy of careful work than plastering, its support and its decoration.—*N. W. Architect.*

THE RAILROAD MEN'S HOUSE.

Cornelius Vanderbilt did something very practical and very praiseworthy for the benefit of the railroad employes who come and go from the Grand Central Depot, in this city, when he spent $100,000 in building a club house for them. It was lately opened for the first time, and Mr. Vanderbilt, with a numerous gathering of ladies and gentlemen as his guests, was present to formally turn over the house to the use of the men and inspect the arrangements that had been perfected for their benefit. The building is situated on Forty-fifth Street and Madison Avenue, and is, in fact, a club house of the very best type, the equal of any other in the city, and much superior to many in all its appointments. Picturesque, without being gaudy, outside, it is a charming addition to the neighborhood, and its sumptuous interior has been so arranged as to make it a place of resort in every way suited to the peculiar wants of the railroad employes



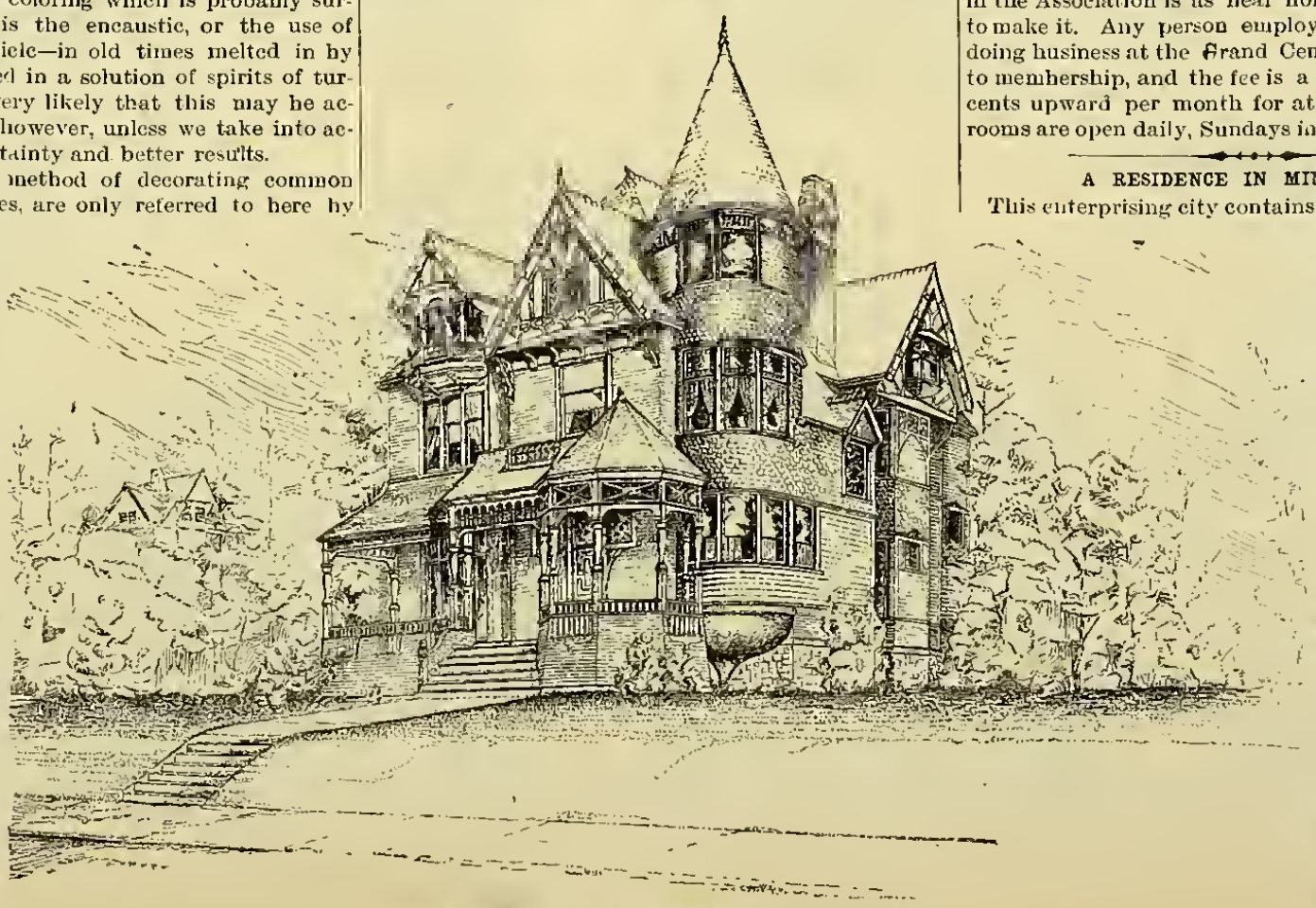
THE NEW RAILROAD MEN'S HOUSE, NEW YORK.

The entrance to the edifice is on Madison Avenue, and the broad hall is fitted up with tile and solid ash. In many of the furnishings the quality of the materials is fully up to anything the best private houses of the city can show. The various features of the club rooms scattered through four stories include a reading room, supplied with ninety-five daily, weekly, and monthly papers, a library, in which are 6 500 volumes, selected with great care and with special reference to the needs of railroad men, several social rooms furnished with checkers, chess, dominoes, crokinole, piano, etc., a gymnasium equipped with the latest improved apparatus of best designs, bowling alleys splendidly built by best makers and supplied with balls of all sizes, bath rooms, tub, shower, and needle baths, hot and cold water, dining room, and sleeping rooms for men detailed in the city over night.

A large hall is provided, and here a series of meetings has been arranged of an entertaining and instructive sort. There will be diuners, too, on anniversary occasions. Midday meetings and concerts are peculiar features of this club house, for many of the railroad men have a leisure spell of several hours in the middle of the day. There will be practical talks by practical men, and medical talks, with a class in the simple rules of first aid to the injured. Classes will be organized in drawing, penmanship, and in vocal music, the last named including the proper intonation in shouting out the names of railroad stations. The whole plan is an extension of and outgrowth from the railroad branch of the Young Men's Christian Association, and now there is not one of the hundreds of Association buildings in the country which is better provided in its field of being a resort for members. Membership in the Association is as near nominal as it is possible to make it. Any person employed by any company doing business at the Grand Central Depot is eligible to membership, and the fee is a payment of from ten cents upward per month for at least one year. The rooms are open daily, Sundays included.

A RESIDENCE IN MINNEAPOLIS.

This enterprising city contains many attractive residences, and among them is that of C. E. Phillippe, of which we give an illustration. C. S. Sedgwick, architect. We are indebted to the *N. W. Architect* for the drawing. The design is in many respects very pleasing.



A RESIDENCE IN MINNEAPOLIS, MINN.

The English army consists nominally of 211,474 officers and men, but it is said that only one army corps can actually be put in the field, and that only by frantic makeshifts. Of the 71,810 officers and men stationed in England, it is alleged that 15,000 are boys under 19, and that 10,00 more are under 20.

A CHURCH OF MODERATE COST.

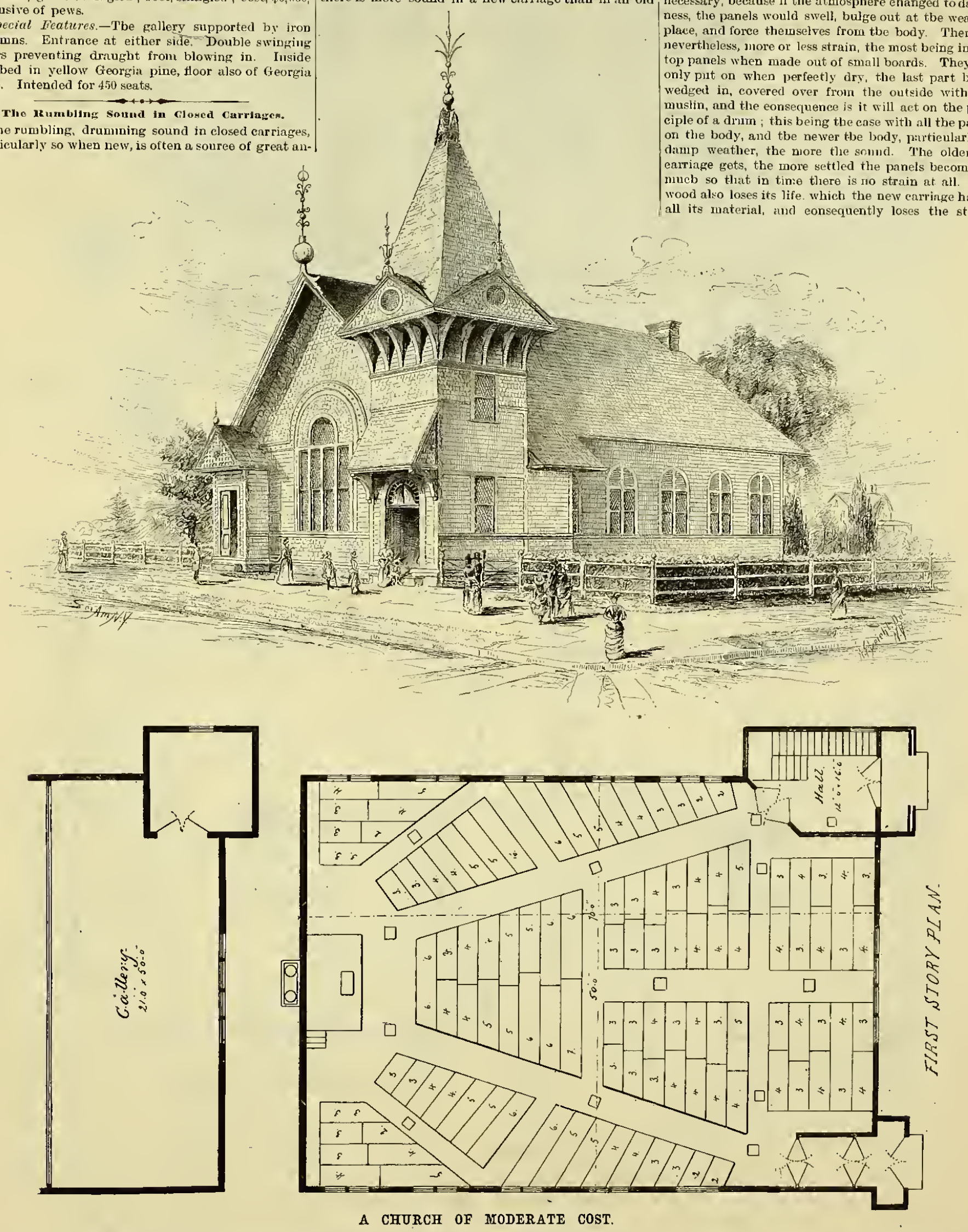
The size of structure is as follows: Front, 50 ft., exclusive of towers; side, 70 ft., exclusive of vestibule.

For arrangement of pews and interior, see floor plans.

Heights.—Cellar, 7 ft.; auditorium, 16 ft. on the sides, and finished up on roof trusses.

Materials.—Foundation, stone; sides and ends, clapboarded; gables, shingled; roof, shingled; cost, $6,000, exclusive of pews.

Special Features.—The gallery supported by iron columns. Entrance at either side. Double swinging doors preventing draught from blowing in. Inside finished in yellow Georgia pine, floor also of Georgia pine. Intended for 450 seats.



A CHURCH OF MODERATE COST.

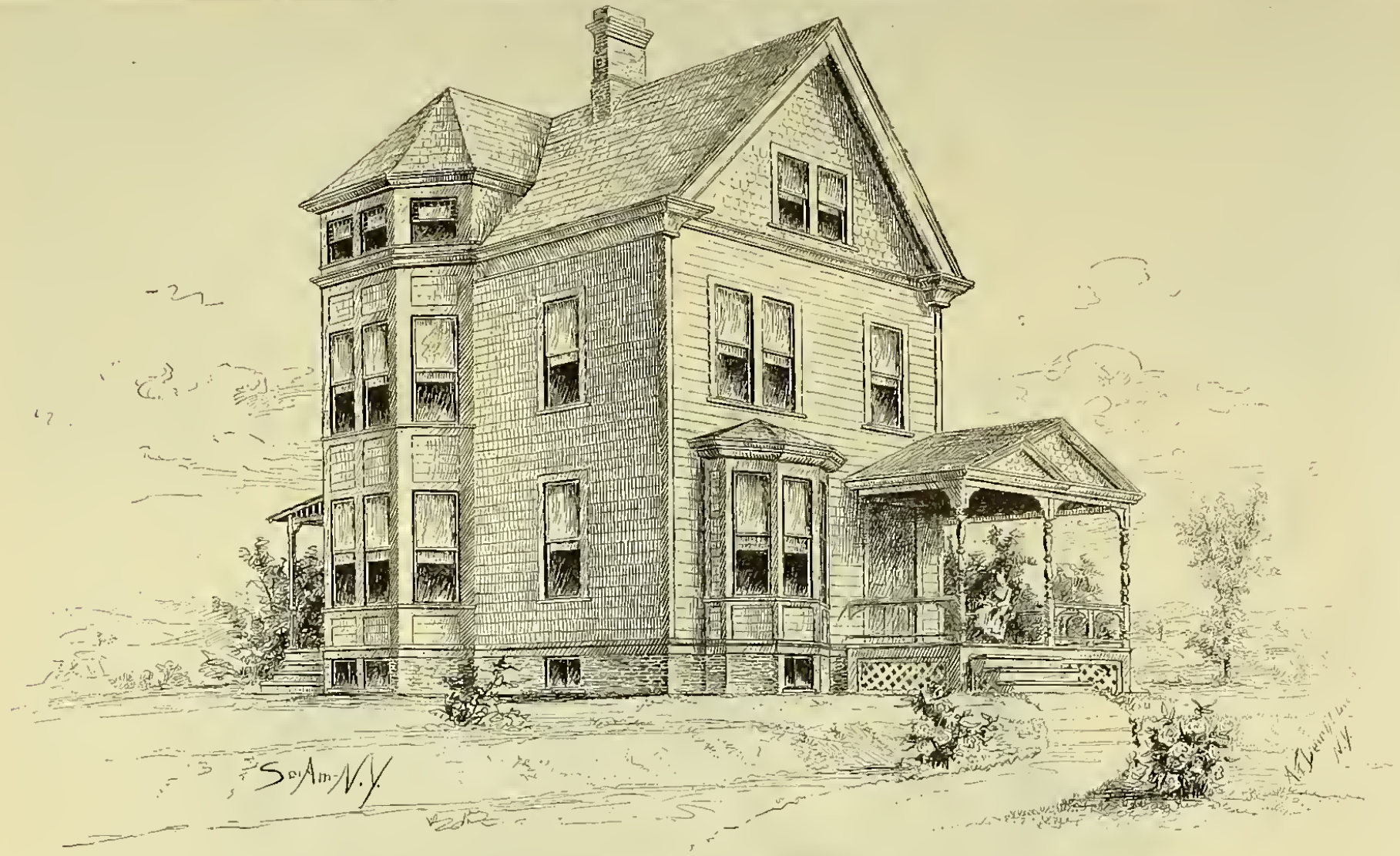
The Rumbling Sound in Closed Carriages.

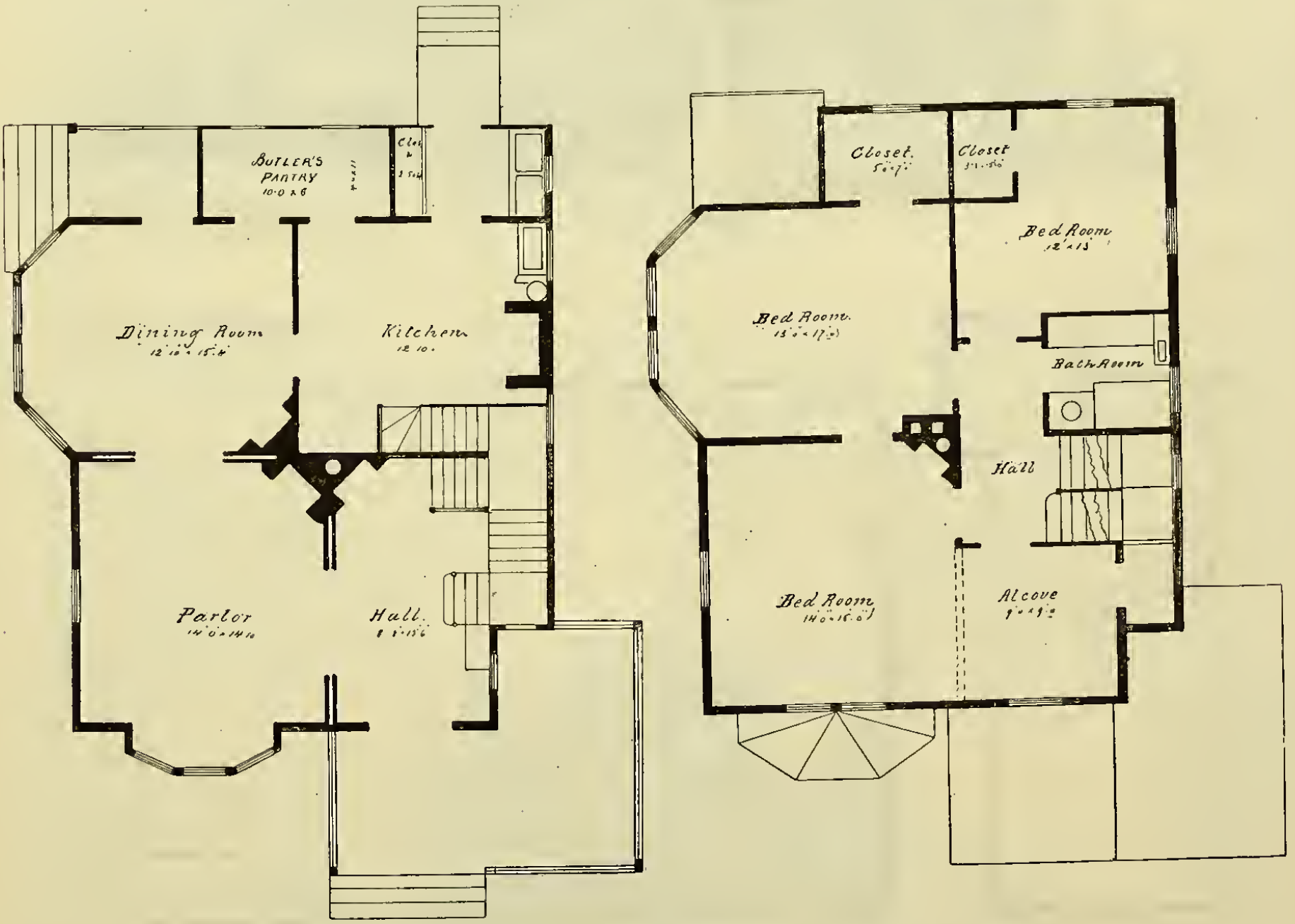
The rumbling, drumming sound in closed carriages, particularly so when new, is often a source of great annoyance to carriage builders. The owner objects to it, claiming that his old carriage made no sound when riding over the road, and the builder knows perfectly well there is no remedy to prevent the sound in new work. Sometimes other noises are mistaken for this peculiar sound, made either by the locks, window frames, or doors. The builder can prevent the locks from rattling by adjusting them carefully. He can also fasten the glass frames so as to prevent any movement up, down, or sideways and the doors also be fixed so as to produce no noise if the body is well built and the rocker plates strong enough to carry the intended weight, but the rumbling sound is produced by the body itself on account of its peculiar construction.

If we have a carriage body only paneled half way up, no sound is discernible, because the body is open above the side panels. The sound is only created by closing the carriage, and the closer we make them, the more sound we obtain. It may be a question with some why there is more sound in a new carriage than in an old one. Many claim that what holds good for an old job should also be applicable to a new one, but this is not so here. Let us go over the method of construction of a brougham or English coach body. The body is a mere skeleton. It has a good foundation, composed of wood and iron, upright pillars stiffened lengthwise with pieces to support the edges of panels and also its centers. Cross bars and curves are made for the same purpose. Over these bars, side pieces pillars, strainers, and curves, the body is covered over with panels and boards, and nearly all these panels are curved, and sometimes curved from both sides lengthwise and crosswise.

It is a common practice, and, in fact, necessary to produce good work, that all panels should be strained or forced together crosswise, and the wider the panel the more it is strained, that is, the panel is put on wider than the necessary space on the body. If the panels are perfectly dry they are not strained, nor is it necessary, because if the atmosphere changed to dampness, the panels would swell, bulge out at the weakest place, and force themselves from the body. There is, nevertheless, more or less strain, the most being in the top panels when made out of small boards. They are only put on when perfectly dry, the last part being wedged in, covered over from the outside with fine muslin, and the consequence is it will act on the principle of a drum; this being the case with all the panels on the body, and the newer the body, particularly in damp weather, the more the sound. The older the carriage gets, the more settled the panels become, so much so that in time there is no strain at all. The wood also loses its life, which the new carriage has in all its material, and consequently loses the strain, which is one reason why there is no sound in old carriages.

This sound can be greatly, if not altogether, prevented, if all the panels, particularly the roof boards, are blocked, that is, take 1 inch square blocks, ¼ inch thick, and glue the blocks tight to each other over the entire surfaces. This prevents all panels from splitting also from warping, shrinking, and swelling, and deadens the sound to a minimum. These blocks are taken from waste pieces of roof boards, either of pine, poplar, or basswood.—*Carriage Monthly.*





FIRST STORY PLAN. SECOND STORY PLAN.

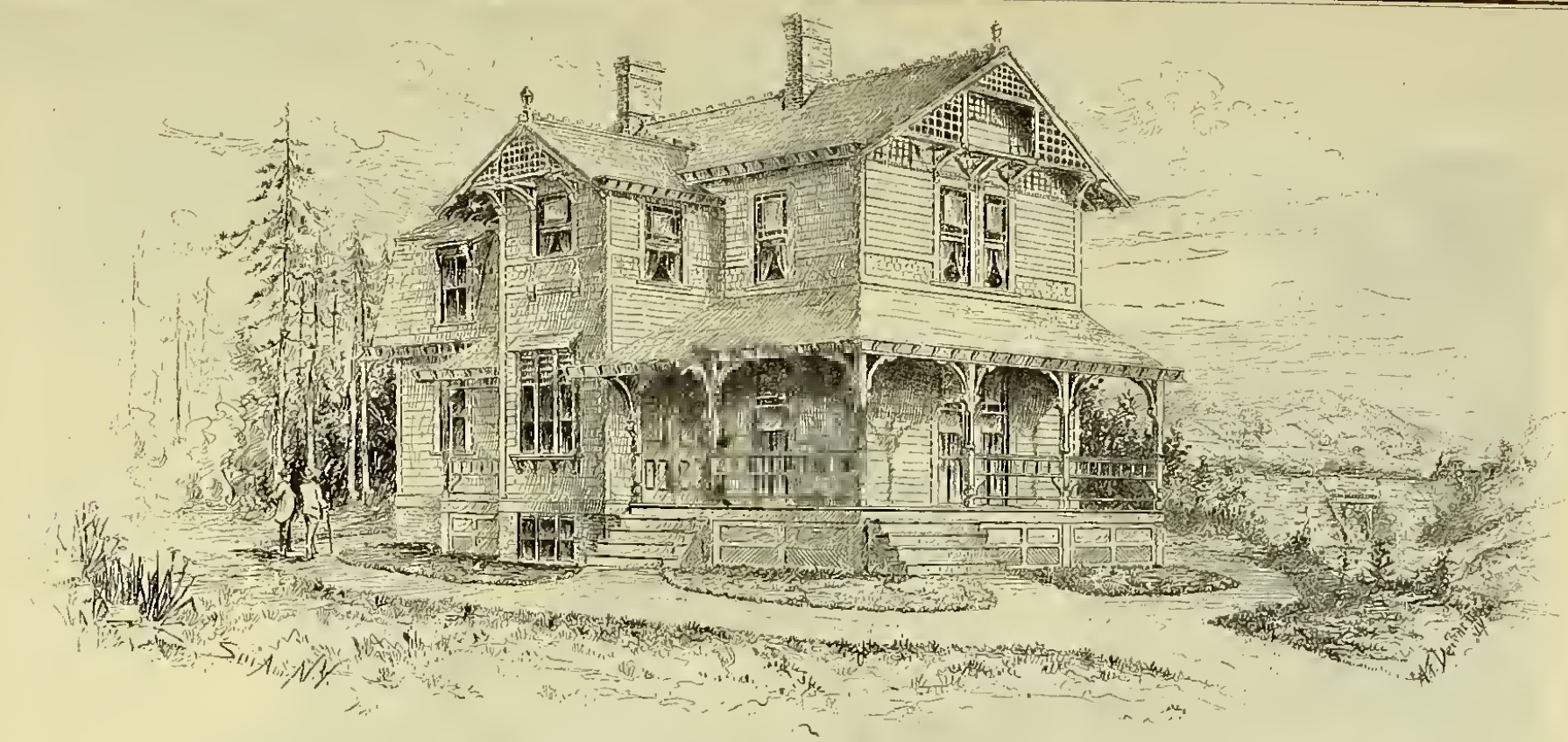
A THIRTY-SEVEN HUNDRED DOLLAR HOUSE.

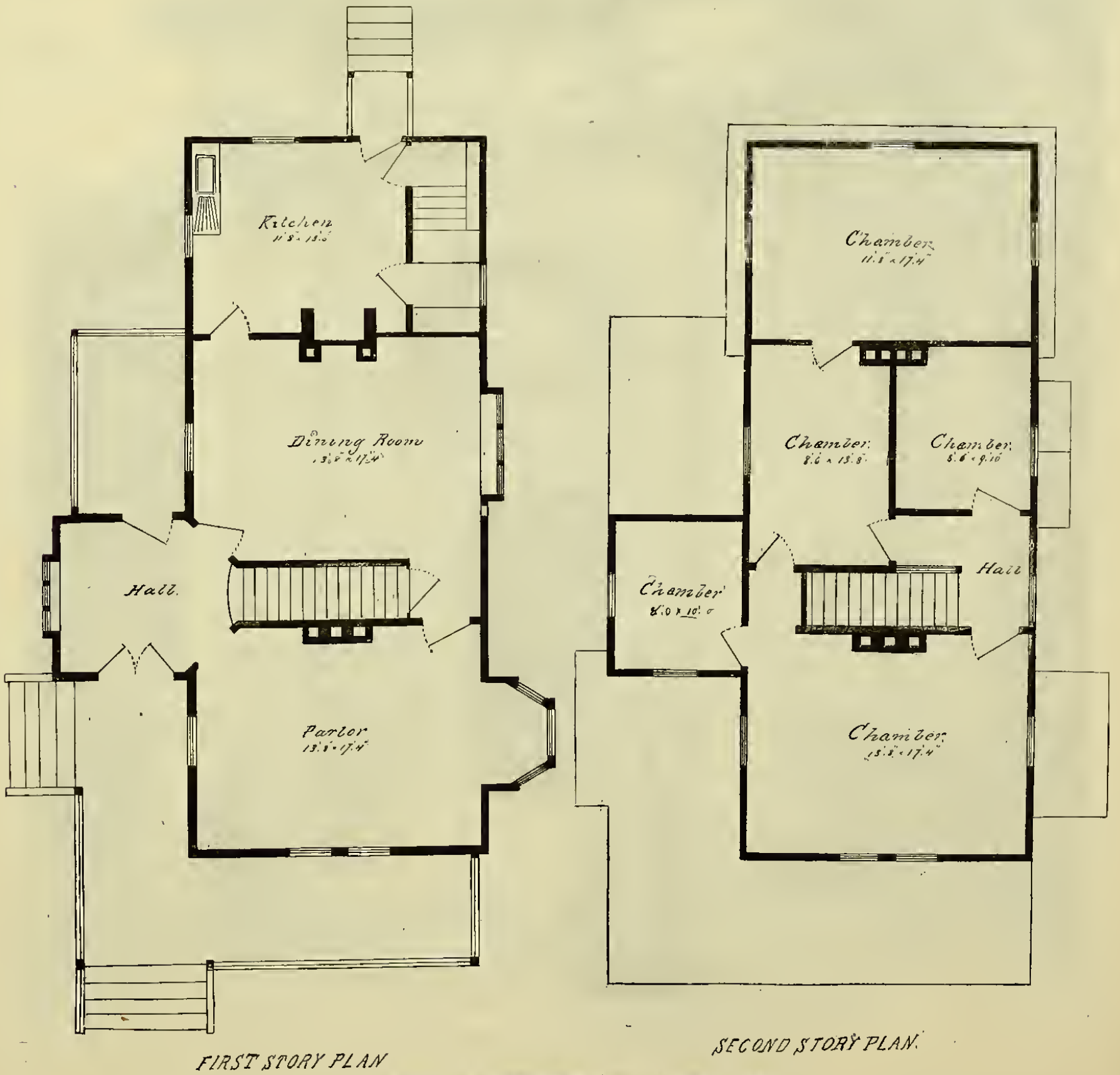
A THIRTY-SEVEN HUNDRED DOLLAR HOUSE.

Our engraving shows a two story and attic house erected at Montclair, N. J., at a cost of thirty-seven hundred dollars. It is 30 ft. wide over all and 37 ft. deep, exclusive of piazza; has all the modern conveniences, including furnace. It has a central chimney, with fireplaces in each room. It has a solid stone foundation. The attic is finished. It is a satisfactory, convenient dwelling, and presents an excellent appearance.

Typhoid.

Typhoid fever is prevalent in many towns in this latitude at this season. That it is largely due to the use of contaminated well water, statistics compiled by a writer in the *Journal*, published at Lansing, Mich., concerning some cases of the disease in that city, illustrate pretty clearly. Fifteen physicians reported seventy-eight cases of typhoid fever. Of these seventy-eight persons who were sick on Sept. 9, only nine were using water from the new city water works, the remainder all using well water. Some of these nine persons were using well water, but had changed to hydrant water on the advice of the attending physicians. There is a positive conviction that wells from which these languishing sufferers took their supply of drinking water were contaminated, and are to-day contaminated, with organic pollution. The reader at once says: "Why do they not use water from the public supply,





FIRST STORY PLAN

SECOND STORY PLAN.

A THIRTY-FIVE HUNDRED DOLLAR DWELLING.

then?" This question is a pertinent one, but does not apply in these cases, as every one of them lives in houses at which the public supply is inaccessible. The moral is that the city should extend its mains, condemn old wells, and thus compel people to take advantage of a public benefit.

A THIRTY-FIVE HUNDRED DOLLAR DWELLING.

Our engraving illustrates an attractive dwelling which has been erected in this vicinity, at a cost of thirty-five hundred dollars. The plan gives much satisfaction. The length is 40 ft. by 26 ft. width. There are roomy piazzas, and the house is supplied with all the modern conveniences. Complete plans and specifications, with elevations, sections, sheet of details bill of estimate for materials, and everything complete ready for the builder, may be obtained at this office. The same remarks pertain to the various plans illustrated in this periodical.

THE NEW MONUMENT AND TOMB OF M. THIERS.

The monument erected to the memory of M. Thiers in the cemetery of Pere la Chaise was inaugurated on he 3d of September. The edifice, which was constructed by Architect Aldrophe, is situated on the summit of a hill to the right of the cemetery chapel. It represents a Renaissance chapel 45 feet in height, and occupying an area of 172 square yards.

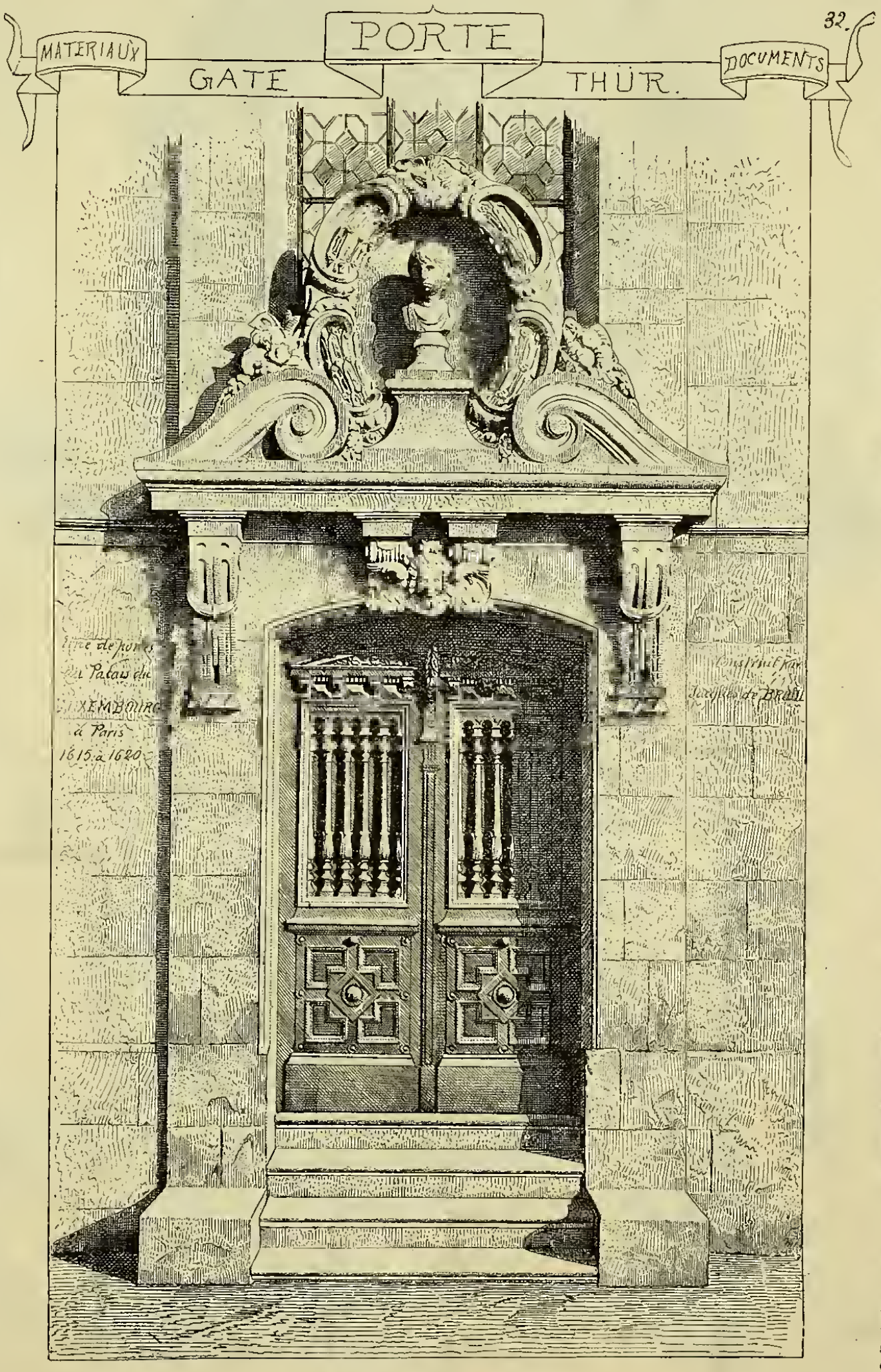
On each side of the front, two Corinthian columns resting upon a granite base support the entablature and the attic that crowns the structure. In the center of the attic, a large tablet of green porphyry carries this device in gold letters: *Patriam dilexit. Veritatem coluit.* The entablature consists of modillions with dentals of a very pleasing effect. Between the columns stands the portico, and, in the center, the door, which is reached by nine steps. This door, which is of bronze, is 6½ feet in width by 13 in height. It is surrounded by a frame with attic, above which, in the arch of the portico, there is a superb bass-relief by the sculptor Chapu. A single block of stone was used, but of dimensions such that it became necessary to get up a system of special vehicles to carry it. It took twenty horses of extraordinary strength to haul it to

THE NEW MONUMENT AND TOMB OF M. THIERS, CEMETERY OF PERE LA CHAISE, PARIS.

its destination. The eminent sculptor has represented the genius of patriotism. In the background, France is seated upon a broken column and holds a flag in her left hand. In the foreground, the genius of patriotism, with outspread wings, stands in front of her, as if to protect her, with saber in hand. At his feet is the corpse of a young man, and in the rear are flames, emblems of war. Above this great *motif*, in the tympans, two genii, one holding a pen and representing Letters, and the other hearing a torch and representing the Sciences, personify the inclinations of a man who was both an eminent writer and a learned historian

In the center, the key supports M. Thiers' cipher, surrounded with laurel leaves.

The two ends are ornamented with pilasters of Corinthian order corresponding to the columns A large arch, recalling that of the entrance, serves to illuminate the interior of the monument. This arch is closed by a bronze casting from the founder Roland. As sculptural *motifs*, the ends carry two dies recalling the name of the Dosne family.—*L'Illustration.*



DESIGN FOR AN ENTRANCE.

Pipes and Joints.

Architects' specifications are not very explicit about the fixing of vertical and horizontal lines of piping—matters which are considered beneath professional attention and care. These details are left to the builder or the foreman to look after, with the result that in a few weeks or months after the completion of the building, inconveniences are suffered owing to leaking of soil or of water pipes. The cast iron rain water pipes break away from their connection with the head, or the joints open through the lengths not being firmly held up by proper pipe supports in the walls. What is commoner than to find that the drain pipe or trap has separated from the vertical stack of pipes, causing a leakage of the rain water through the wall? The papering of a room gets irretrievably spoiled or discolored before the fault is discovered and rectified. A few plain rules are required to be observed in making the joints of cast iron socket pipes for drainage purposes, or wherever leakage is to be prevented. One of the best plans is to insert a gasket of picked oakum into the space between the spigot and hub, filling up the space with molten lead. The lead is afterward consolidated by means of calking tools, and if done properly a water tight joint can be made in this manner. To secure iron pipes to a wall, various plans are adopted. Iron hooks are generally used to clinch the pipe; but a proper mode of fixing can only be insured by giving each pipe length a solid rest or an iron support let into the wall, to take the socket or hub of each, so that the weight may bear on it. There are now introduced fastenings which keep the pipe a little away from an outer wall, so that in case of overflow from the gutter or head the water runs down the spout, and does not touch the wall. In America expanding conductors are used, so that during freezing weather the seams open and prevent the pipe from bursting. These pipe fasteners can now be obtained if architects only take the trouble to specify them. In very lofty buildings the contraction and expansion of these pipes ought to be provided for, especially in waste pipes receiving hot water. The failure in the joints often arises from two different kinds of pipe coming together. The joints, for example, between stoneware pipes and iron pipes are seldom found perfect. The use of brass couplings or ferrules is preferable to cement, the iron pipe being securely calked at the end. The jointing of wrought iron pipes is best done by screw threads smeared over by a thick paste of red and white lead and boiled oil. For lead pipes wiped or blown joints are used. The latter, if properly done, will answer for cold supply between cistern and tank or cylinder. In iron service piping for gas the runs should be carefully marked, and be as straight as possible, avoiding bends. One of the chief directions to be observed by the gas fitter is that the pipes should not be laid level, but should have a fall to the main or toward the meter. Every fitter is supposed to know this condition, to avoid the accumulation of condensed vapor in the pipes, and also that every socket and joint should be white-leaded so as to insure air-tight junctions. Strange to say, however, the modern system of laying pipes is often sadly at fault, and whether it be the sanitary fittings, the water supply, or the gas service, it is not uncommon to find these rules neglected.—*Building News.*

Jack Frost in Water Pipes.

Among the popular fallacies none is more prevalent than that relating to the expansion and bursting effects of ice in our water pipes. Even among intelligent plumbers the belief seems to be very general that the mischief takes place when the ice commences to melt; and, in fact, it is only a week ago that we read in one of our scientific exchanges that it was well known that water expands as it first congeals, and also goes through a second course of expansion as it first commences to melt—a scientific paradox which the writer makes no attempt to explain, and which, as a matter of fact, exists solely in his imagination. It is somewhat laughable to hear some people descant upon the best means of thawing pipes so as to avoid bursting. Some advocate a gradual melting of the ice, while others are in favor of a hot douche which will heat the exterior first. The effects, however, are just the same, for in either case whatever damage is to result from that particular freeze was done long ago, and the burst actually took place just *before* the freezing, rather than during the process. The pipe was cracked by the expansion, and a piece of ice protrudes through the aperture and serves as a plug to check the flow; but days, weeks, or even months afterward, when a warm thaw sets in, this ice gorge will be melted and the damage exposed. Pipes do not always burst after a freeze. Lead is very ductile, and will often yield or stretch enough to allow for the expansion of the ice without making an open fracture; but the pipe is gradually weakened by each successive freeze, and will become as thin as paper before giving way. Pipes are most likely to freeze at the top of a curve or bend, where some slight obstruction tends to collect the ice, which being lighter than the water rises in flakes, which soon become united in a compact mass.—*Sci. Arena.*

A HOUSE FOR $3,800.

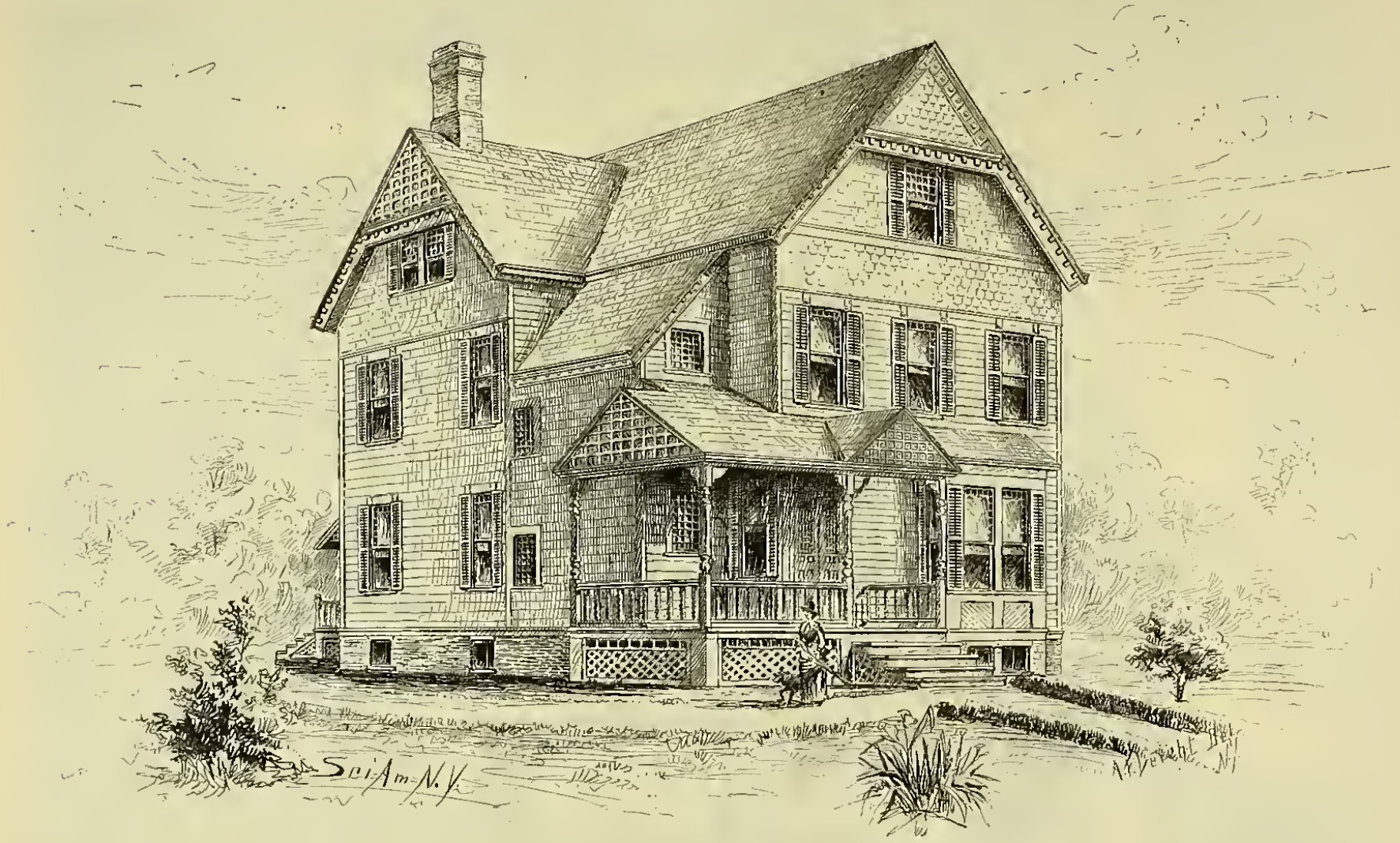
Size.—Front, 28 ft. ; side, 38 ft., exclusive of piazza and bay window. For size of rooms see floor plans.

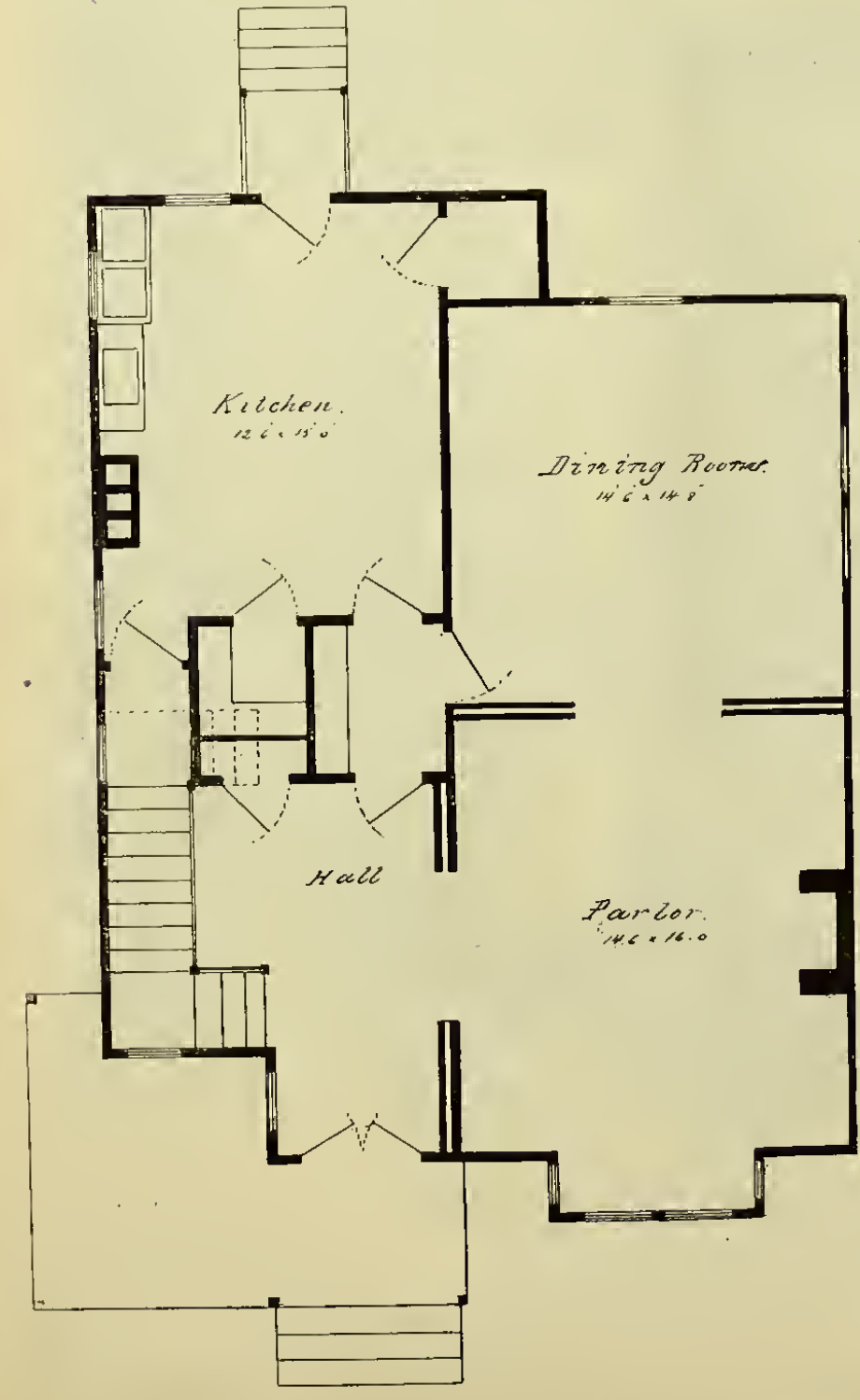
Height of Stories.—Cellar, 7 ft. ; first story, 9 ft. 6 in ; second story, 9 ft. ; attic story, 8 ft.

Materials.—Foundation, stone ; first and second stories, clapboarded ; gables, shingled.

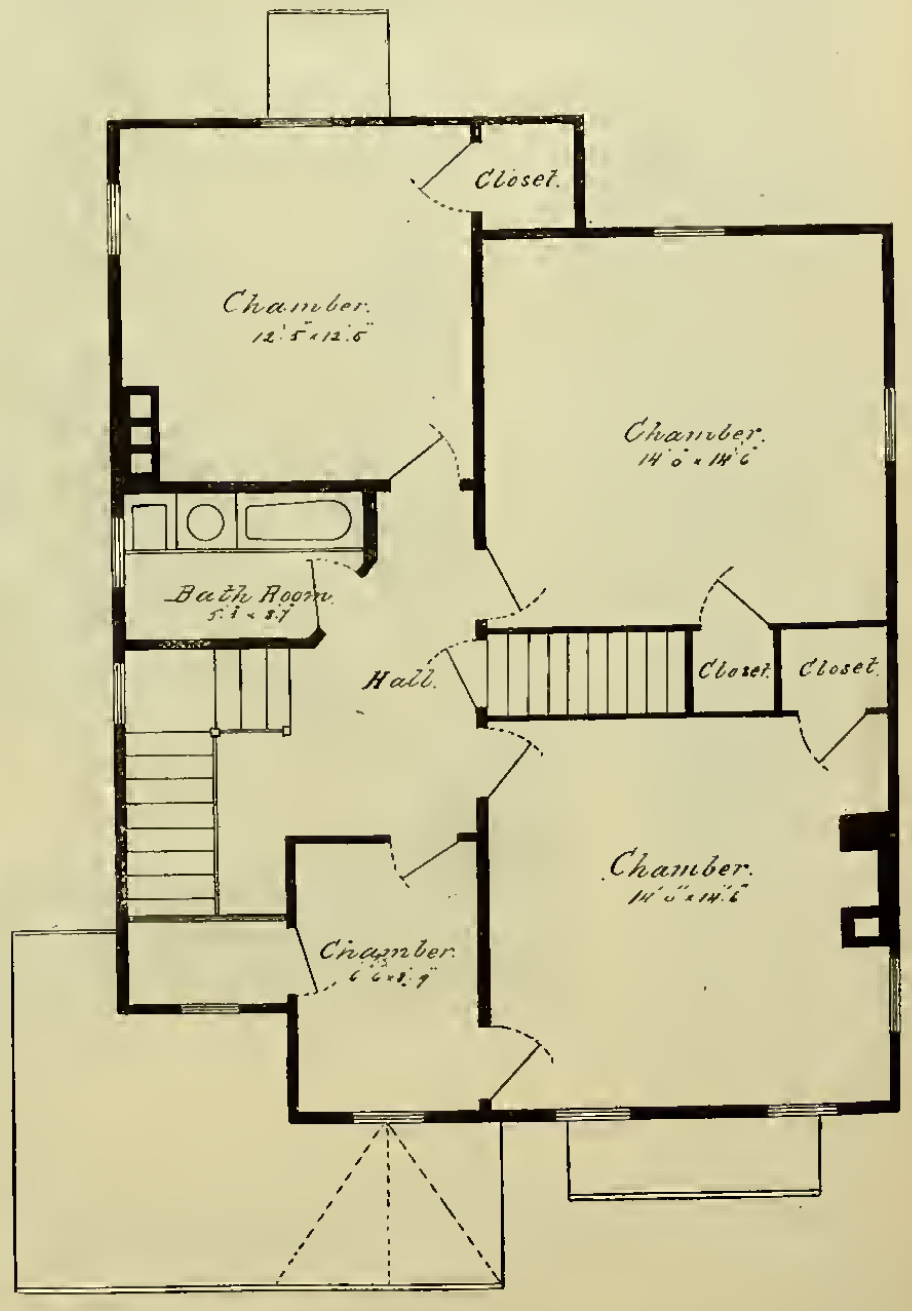
This house has been built. The cost was $3,800, including plumbing, furnace, and everything complete.

Special Features.—Sliding doors connect the dining room, parlor, and hall. There are open fireplaces in the parlor and chamber. Closets are numerous and large throughout. Two bedrooms are finished in the attic. Cellar under the entire house, with cemented bottom.





FIRST STORY PLAN.

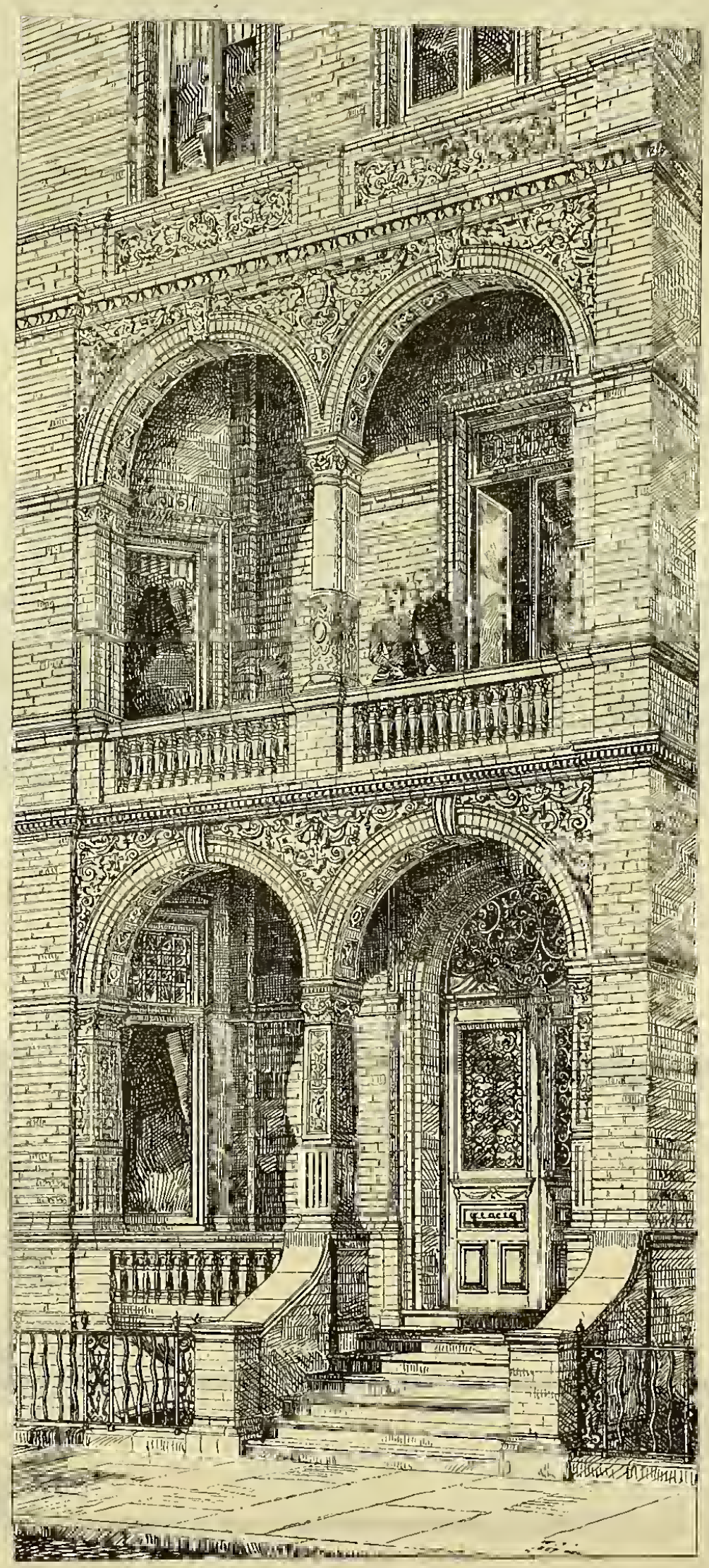


SECOND STORY PLAN.

A HOUSE FOR $3,800.

A CITY FRONT.

This Royal Academy drawing shows part of a block of mansions now building in Grosvenor Square, London. These houses erecting at the southwest corner of Grosvenor Square are from the designs and are being built under the superintendence of Mr. W. H. Powell, architect. The buildings are faced with red pressed brieks, red rubbers being used for the gauged arches, carved frieze, spandrels, etc.—*Building News.*



DESIGN FOR A CITY FRONT—W. H. POWELL, ARCHITECT, LONDON.

The Effect of Freezing on Cement.

The effects of freezing on Portland cement mortar have not been found injurious. In America experiments have shown that masonry laid with Portland cement mortar has stood no ill effects from freezing, while the American natural cement mortars have shown disintegration to a considerable depth from the surface. Mr. Alfred Noble describes the building of piers of the St. Louis River bridge on the Northern Pacific Railroad, in the winter of 1884-85. Portland cement was used, the proportions of cement and sand being 1 to 1½ for face stone and 1 to 2½ for backing. During the freezing weather salt was used in the mortar, and the sand was warmed; but the mortar froze with the temperature at 20 degrees on the stone. After some time the mortar was found to have set firmly and as well as that used in the milder weather. Other experiences have confirmed the author's statement. The American natural cements, on the contrary, have been found to disintegrate during frost. The Rosendale cement has, for instance, been proved to weather badly on the surface. But if, during the cold weather, brine or salt water is used for mixing strong enough, the results have been found satisfactory, even with Rosendale cement, when a large proportion of cement is used. When a strong solution of salt is not used in mixing, the failure of the mortar is almost certain. The proportion of salt necessary may be gathered from the following rule: Dissolve 1 lb. of rock salt in 18 gallons of water when the temperature is 32° Fahr., and add 3 oz. of salt for every 3° of lower temperature. The masonry laid with mortar so prepared stood well. Many instances are recorded of the value of using Portland cement in places where the mortar is likely to freeze before setting. The use of salt in cement mortars also greatly increases their tensile strength under the conditions of freezing. Salt water is found, indeed, to be as good as fresh for mixing, especially in hydraulic works, though Mr. Faija concludes from experiments he has made that for marine purposes the portions of work below high water level should be mixed with fresh water, and those above it with sea water. There is clearly a want of agreement among English authorities upon the point; but if we take the experience of American engineers, the advantages of mixing with salt water are strongly made out.—*Building News.*

The Wood of Thuja Gigantea.

Thuja gigantea is, among the trees on the northwest coast, the Indian's best friend, for out of its wood and bark he manufactures endless varieties of domestic, hunting, fishing, and warlike utensils. Most of their canoes are hollowed out of it, at least in Vancouver Island; and there is a case quoted where a canoe made out of Cupressus nutkaensis, in Vancouver, was quite an exception, and indeed the canoe was probably traded from some of the northern tribes, and not of Vancouver manufacture at all. The Indian ropes are also very commonly twisted out of its bark. The tree which I took for Thuja plicata, and out of which I happened to see the Indians, just at the time I wrote the letter quoted, twisting ropes, I believe, from after investigation, to have been only a stunted form of T. gigantea, and that T. plicata is not a separate species, but for reasons which I have given in another place, and cannot now again repeat, is, indeed, only a variety of T. gigantea. North of latitude 53° Cupressus nutkaensis takes the place of Thuja gigantea, and is applied by the Indians to all the useful purposes of T. gigantea, and to some others in addition. For instance, at the Matlakatlah Mission on the coast of British Columbia, in about latitude 54° N., where there are fine groves of it, it is sawn into lumber and sent to Victoria, where it meets a ready sale among the cabinet makers, as it takes a fine polish and works beautifully. Most of the prettily polished disks and little cylinders used by the Indians in gambling are made either from this wood or from that of Acer macrophyllum. It is also valuable for ship or boat building. The wood of T. gigantea is whitish, but in its fresh state is yellower, hence the name "yellow cypress" applied to it. It is light, tough, durable, and easily worked. The property of durability it shares with T. gigantea, and in addition it has a pleasant fragrance. On this account the Russians about Sitka used to call it dushnik or "scented wood." It was absolutely at one time exported to China, and returned marked with Chinese characters, which warranted it as "real Chinese camphor wood," puissant for many purposes, and a sovereign remedy against moths in drawers! In repairing old Fort Simpson, the only log found sound after twenty-one years' trial of those used for "underpinning" was one of this. —*M., the Garden.*

A Dutch Interior.

Here is the favorite sitting room of the house, opening out of the hall and the *serre;* the "antique room," an excellent specimen of what several other Dutch gentlemen also have, or aim to have, for it neeessitates, perhaps, years of careful collection and selection. It is a nearly exact representation of an old-fashioned sitting room, such as you shall see in interiors by Nicolas Maes. The Dutch are intensely conservative, loving their forefathers' ways and traditions, and treasuring their family heirlooms of old blue Oriental china, old native delf, carvings, brasses, fine engraved glasses, and notably their old silver. This room, as several others I saw, would give an impressionist the idea of brownness, brightened by brasses and blue china. Dark brown are the high wainscot, the paneled ceiling, carved chimney piece, and the beautiful old Cordovan leather wall hangings stamped in faded gold; brown also the carved stiff furniture and its cushions. But the gleam of old brass chandeliers and sconces brightens the gloom, many of the latter set round the wainscot ledge being of strange shapes an antiquarian would vainly covet. And besides the usual brass fire irons hung up on either side of the old tiled fireplace are some less known in England; a brass *repousse* box holding dried hempstalks to light candles, great snuffers, and a long blowpipe for the fire, also useful in extinguishing candles placed high. Two heavy brass handles depend also from the high chimney board, their use puzzling me. "What are they for?" "Why, for old gentlemen to hold by when lifting up one foot to warm their toes!" explained Hugo cheerily. "Our ancestors were heavy, you see, and could not stand long on one leg without support." After the brasses, the blue china relieves the eye in the rich somberness of the room. Big jars, and lesser porcelain of all shapes, are ranged on the wainscot and all about the room; with queer delft plaques showing sea pieces, and shaving dishes with nicks to hold the victim's neck.—*Illus. Mag.*

Spontaneous Combustion.

Shavings from the oiled wood used in the manufacture of planes at an Eastern factory were recently put into a barrel, and twenty-four hours later were found to be almost on fire, their temperature being over 300° F. Before six o'clock the shavings were charred and smoking a few inches beneath the surface. This is a practical demonstration of spontaneous combustion, and illustrates how many mysterious and destructive fires may have originated. Oiled rags and waste operate in the same way.

AN animal with the head and tail of an alligator and the back and claws of a tortoise is on exhibition at the store of George Hulse, a Liverpool importer of turtles. It is called an alligator tortoise, and was captured by an English sailor in the swamps near New Orleans. The English naturalists have never seen anything like it before, and are trying to buy it for a public museum.

A HOUSE FOR A NARROW LOT.

The size is as follows (not including verandas and bay windows): Front, 20 ft.; sides, 49 ft. 6 in.

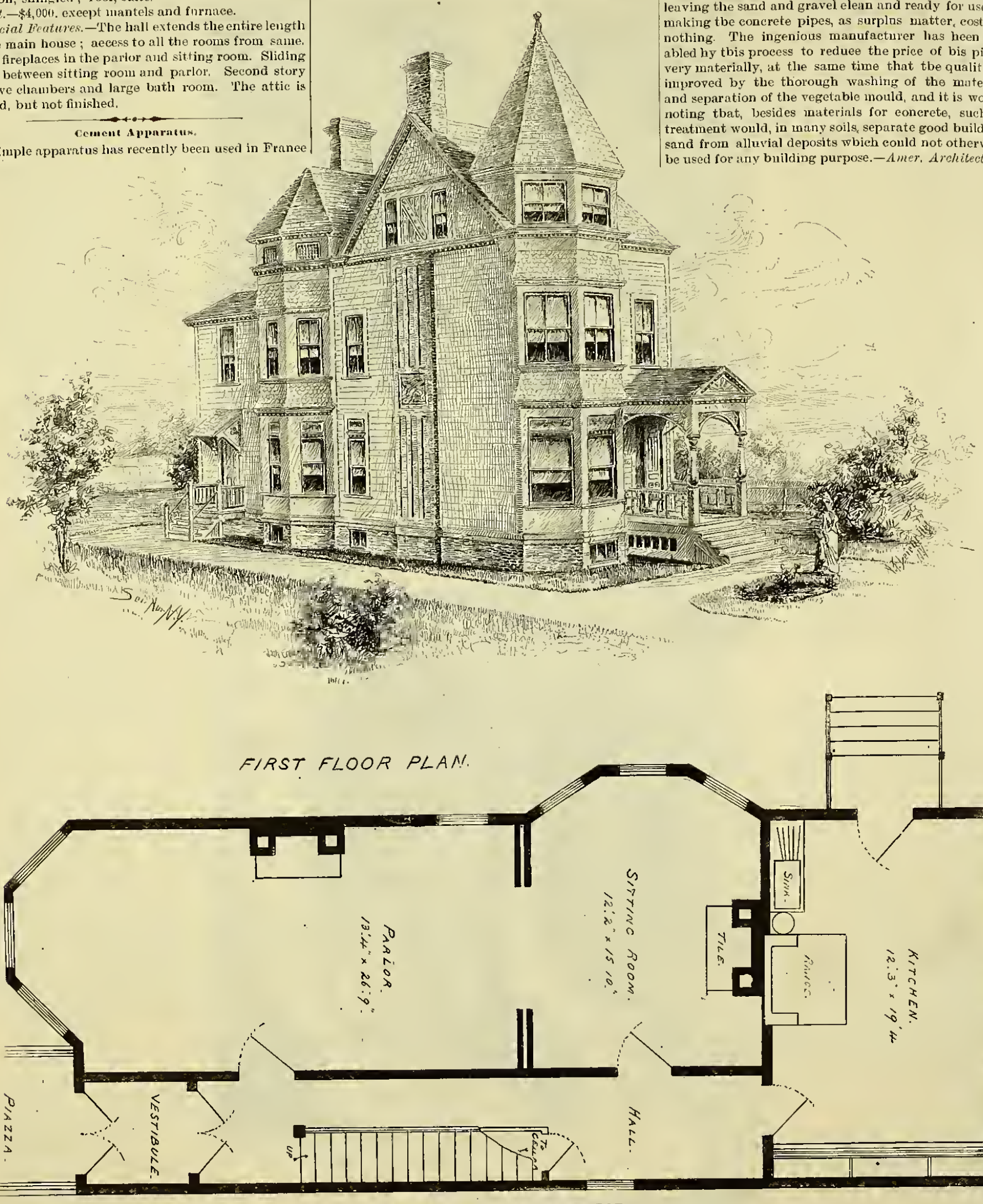
For size of rooms see floor plans

Height of Stories.—Cellar, 7 ft.; first story, 10 ft.; second story, 9 ft.; attic, 8 ft.

Materials.—Foundation wall, brick; first and second stories, clapboarded; gables and band courses around octagon, shingled; roof, slate.

Cost.—$4,000, except mantels and furnace.

Special Features.—The hall extends the entire length of the main house; access to all the rooms from same. Open fireplaces in the parlor and sitting room. Sliding doors between sitting room and parlor. Second story has five chambers and large bath room. The attic is floored, but not finished.



A HOUSE FOR A NARROW LOT.

Cement Apparatus.

A simple apparatus has recently been used in France for preparing the ingredients of concrete, which might, we should suppose, be used in works on a large scale with considerable advantage. As described in a letter to *La Semaine des Constructeurs*, the apparatus, which seems to have been originally devised by a manufacturer of concrete sewer pipes, consists of a cylinder of copper, about three feet in diameter, mounted on a hollow shaft, which is pierced with many holes. The cylinder is also pierced with holes of varying sizes, arranged in zones, and a helix of copper is set in the interior. By a simple mechanism, driven by water power from a brook, the cylinder is made to revolve about once a minute, and at the same time water is forced under pressure into the hollow shaft. Earth from the gravel bank near which the machine is set up is then thrown by shovelfuls into the upper end of the cylinder. The interior screw drives the material forward, at the same time that it is washed by the water issuing from the hollow shaft. The holes in the upper part of the cylinder are the smallest, and the turning, shaking, and washing of the earth sifts out there the finer portions, while the rest is moved along to the next zone of larger holes, which allow the coarser gravel to escape, the small pebbles falling through the next zone, and the larger ones remaining till the last. The different sorts of material are collected in bins, and the washing water, which holds in suspension the fine sand and loam, is allowed to run off into a basin, where it is lightly stirred with paddles agitated by the same power that drives the cylinder. In this basin the fine sand is deposited, but the movement of the water prevents the subsidence of the loamy particles, which escape through an overflow into another basin, and are there allowed to settle quietly. The material shoveled from the bank is thus, by one operation, sorted into large pebbles, small ones, of two or three distinct sizes, gravel, sand, fine sand, and loam. The large pebbles, which are unsuitable for use in making the concrete pipes, are sold for road metal or similar purposes; and the fine, soft deposit of loam in the last basin is disposed of to farmers for manure. The proceeds of the sale of these two products are sufficient to pay the whole expense of handling and treating the earth, leaving the sand and gravel clean and ready for use in making the concrete pipes, as surplus matter, costing nothing. The ingenious manufacturer has been enabled by this process to reduce the price of his pipes very materially, at the same time that the quality is improved by the thorough washing of the material and separation of the vegetable mould, and it is worth noting that, besides materials for concrete, such a treatment would, in many soils, separate good building sand from alluvial deposits which could not otherwise be used for any building purpose.—*Amer. Architect.*

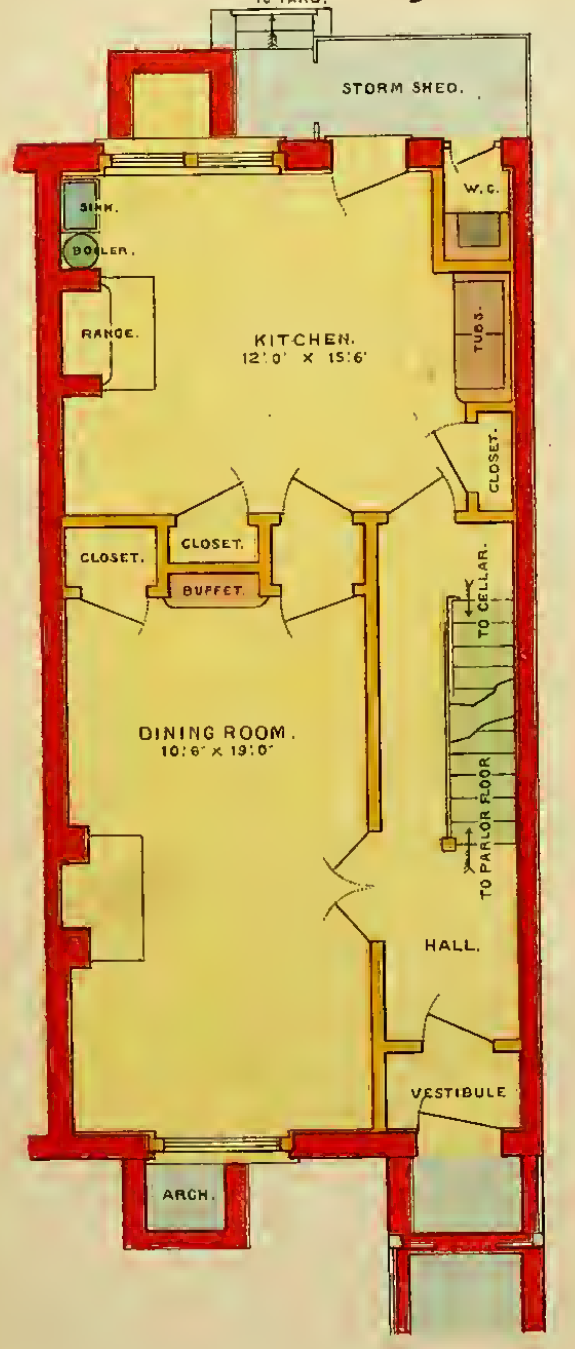
To Repair Stone Steps.

To restore stone staircases of which the steps have became worn, the *Semaine des Constructeurs* advises that the worn parts be moistened with a solution of silicate of potash (soluble glass), and then that the step be given its original form by means of a paste composed of hydraulic lime and silicate of potash to which fifty per cent. of fine silicious sand is then added.

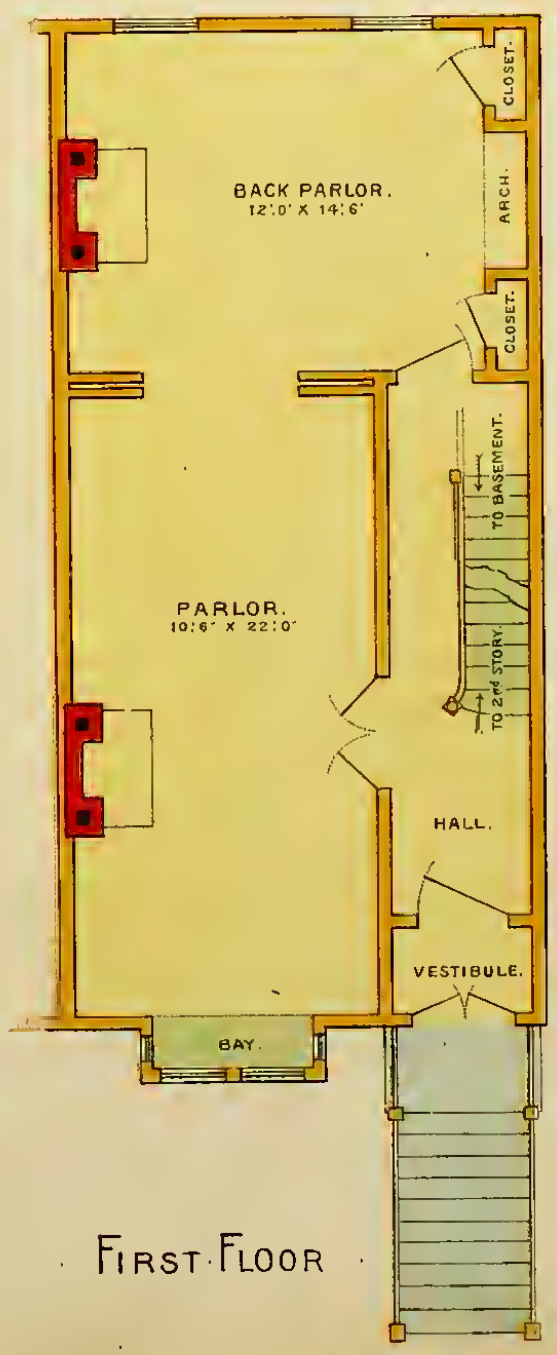
The durability of the steps thus restored is comparable to that which would be obtained with the best stones, and the adhesion of the added portion is perfect.

City Frame Houses of Moderate Cost.

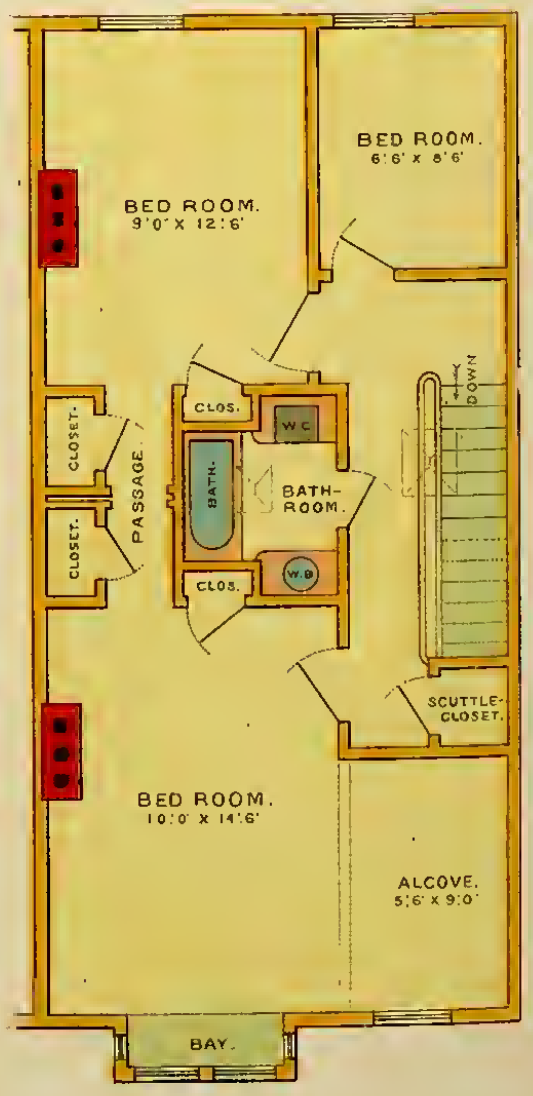
TO YARD.



BASEMENT

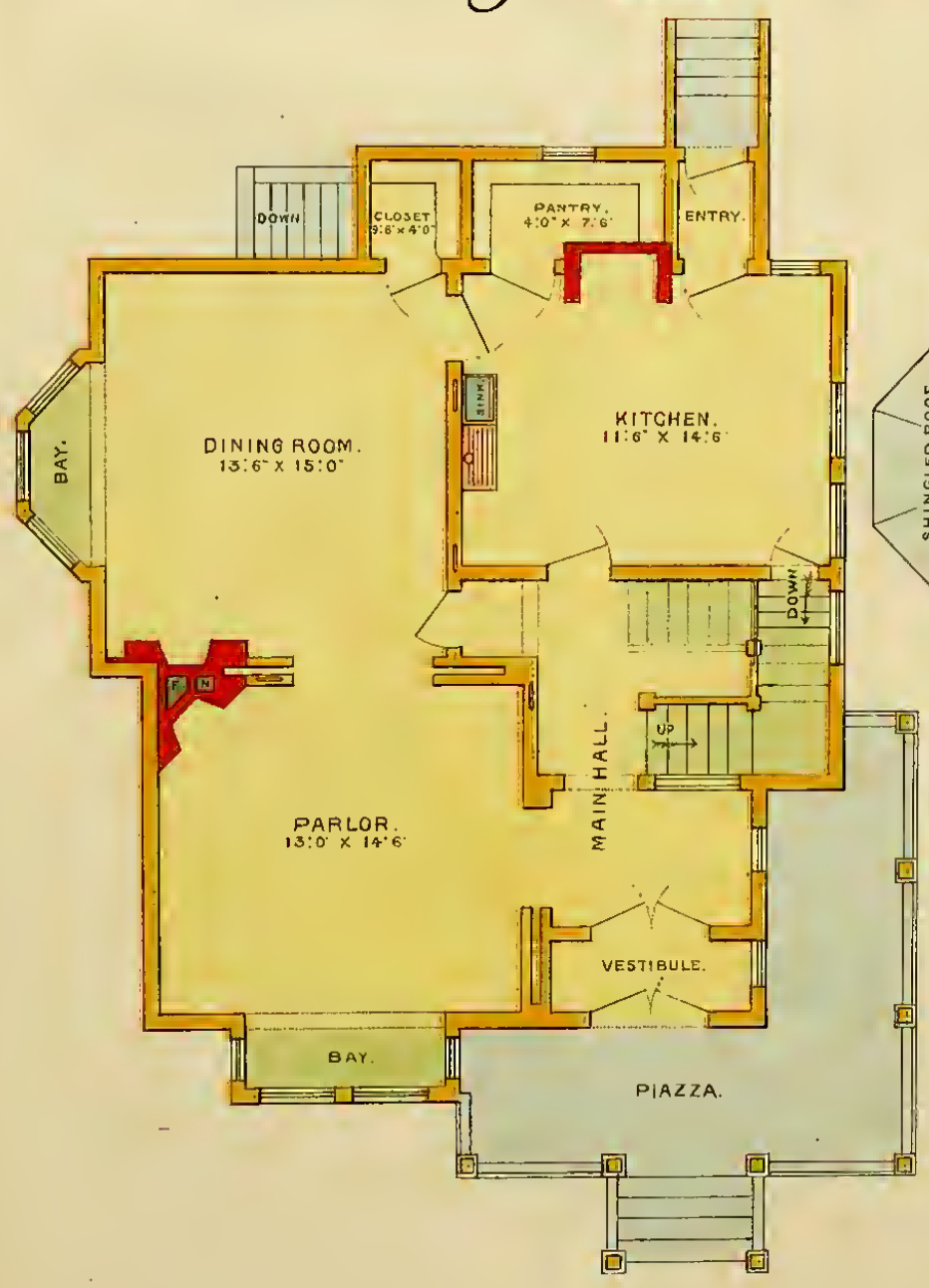


FIRST FLOOR

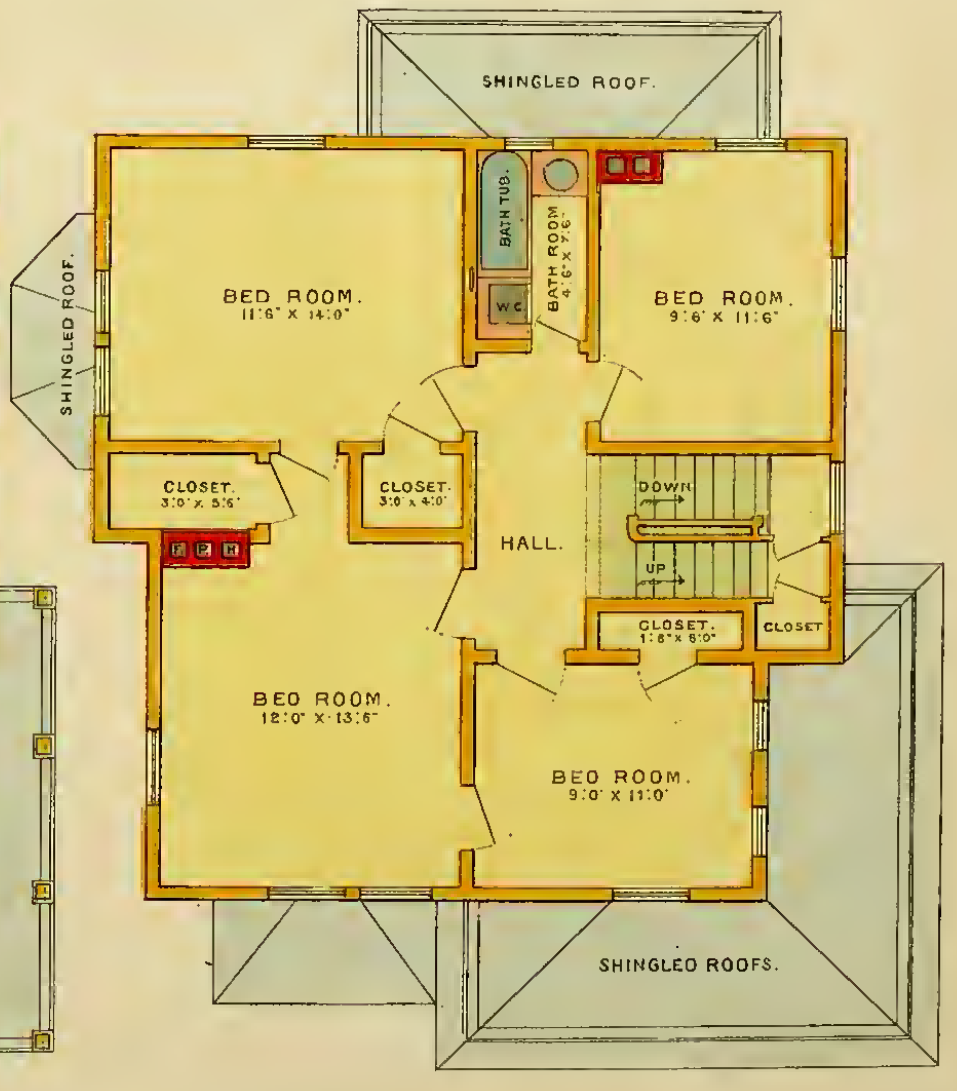


SECOND FLOOR

A Dwelling for ~~Five~~ Two Thousand Five Hundred Dollars.



Plan of First Floor.



Plan of Second Floor.

A $4,500 RESIDENCE.

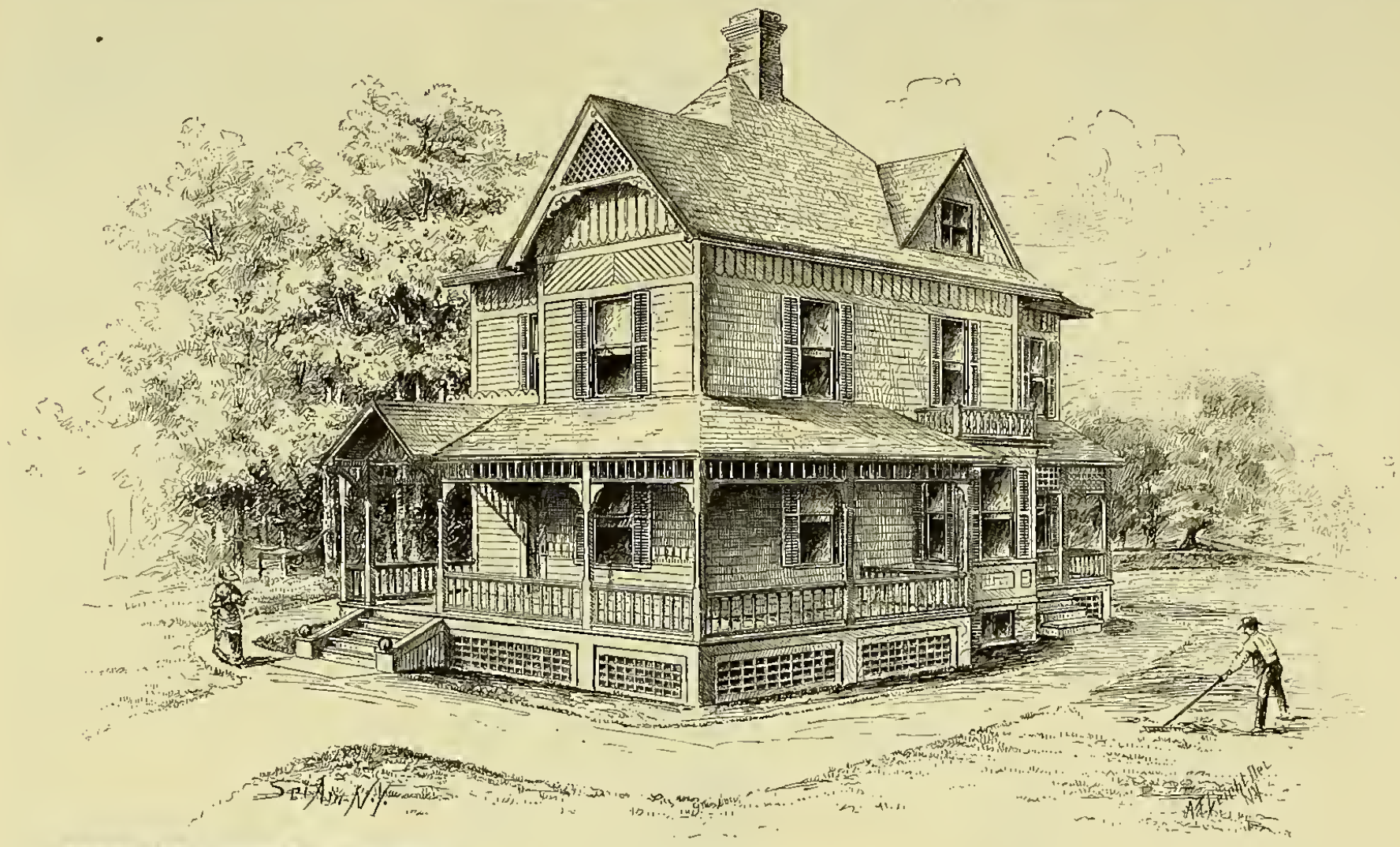
Size.—Front, 25 feet, exclusive of porch and bay windows; side, 47 feet, exclusive of porch. For size of rooms, see floor plans.

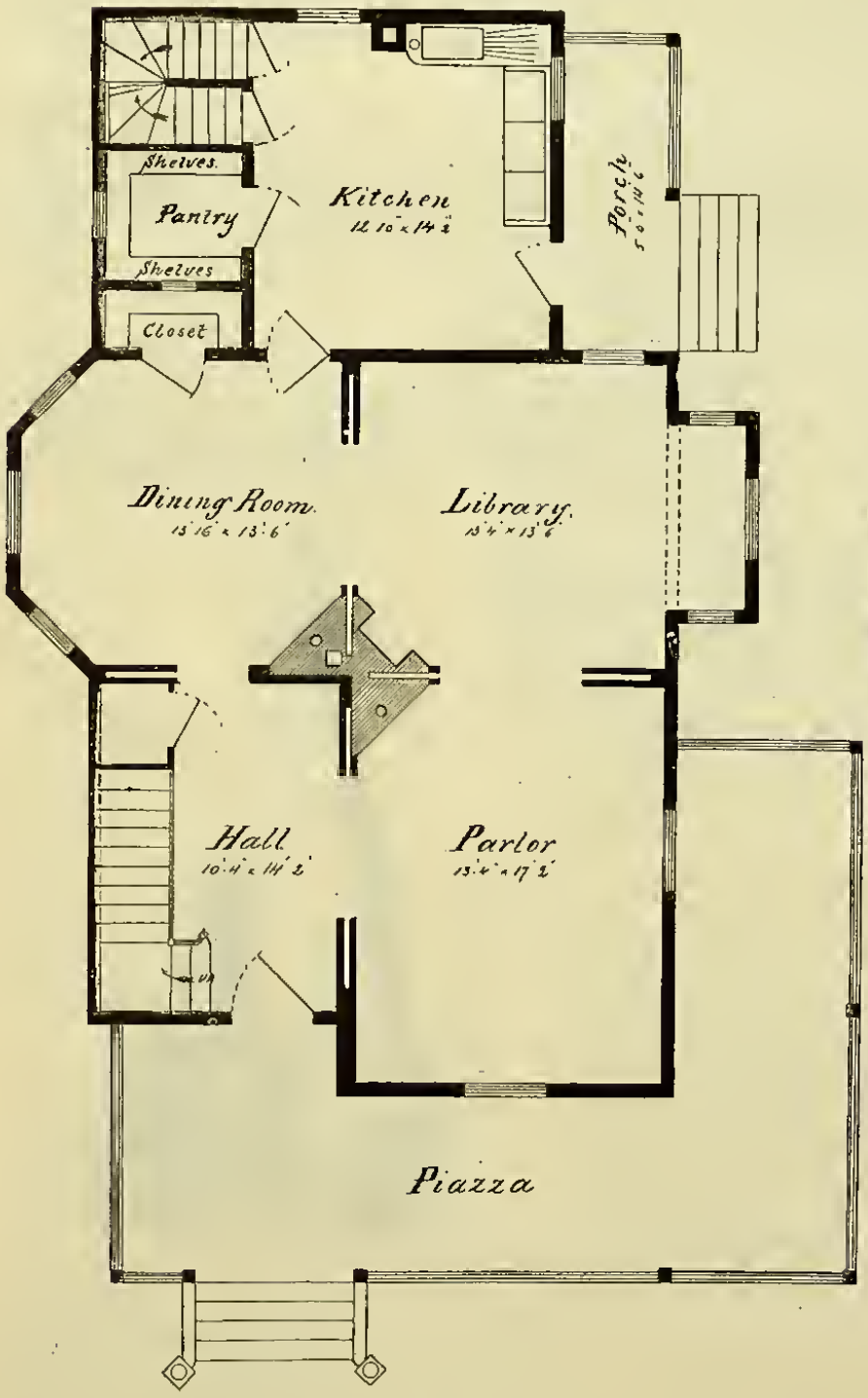
Height of Stories.—First story, 10 feet; second story, 9 feet 6 inches; attic story, 8 feet.

Materials.—Foundation, stone walls and brick piers; first and second stories, clapboarded; above second story windows, curtain boards with battens; gables finished in curtain boards and ornamental lattice. The entire third floor will be floored over, and three rooms can be finished thereon, if necessary.

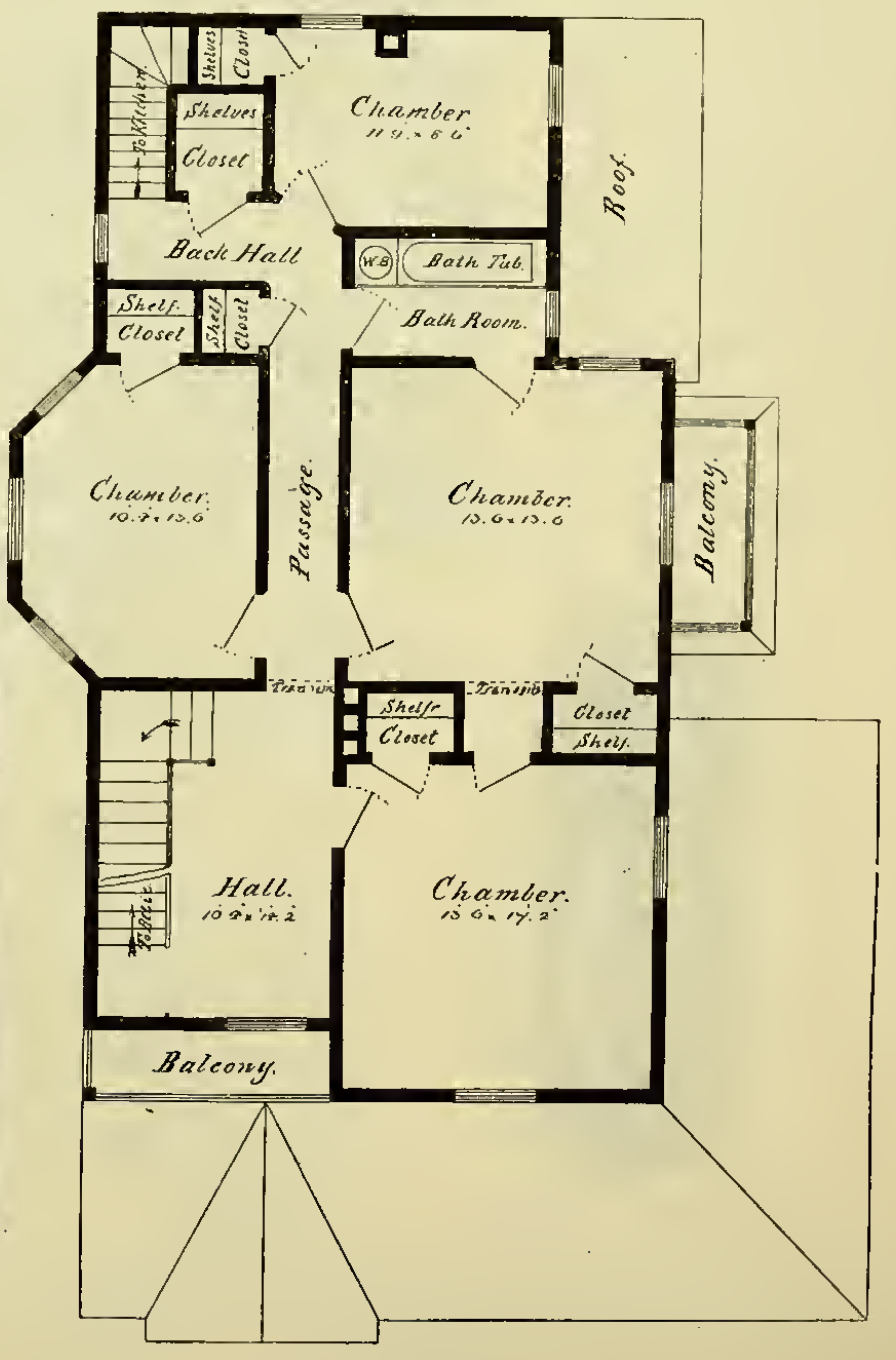
Cost.—$4,500, including plumbing, furnace, and everything complete.

Special Features.—Sliding doors connect the dining room, library, parlor, and hall. The chimney being in the corners of the dining room, parlor, and library, there is a fireplace in the library and place for stove in the dining room, if necessary. There are numerous and large closets throughout the house.





First Floor Plan.



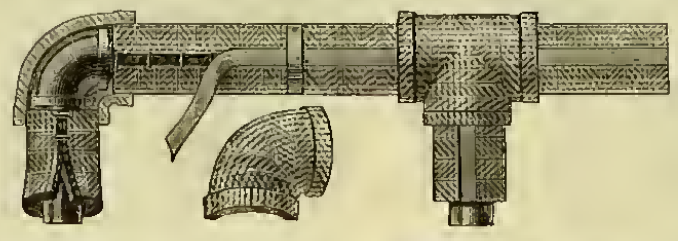
Second Floor Plan.

A $4,500 RESIDENCE.

INSULATED AIR COVERINGS FOR STEAM, WATER, AND GAS PIPES.

The engineer of the present day can no longer afford to leave metallic pipes used for steam conveyance exposed to the atmosphere. The engineering of the day is largely concerned in economy. The generation of steam has been brought to a comparative perfection. The boiler cannot be expected to do much better work than it now executes. But the steam engineer who contents himself with a high boiler performance neglects the most important source of waste. We refer to condensation in the pipes. An uncovered pipe is an atmospheric condenser. As fast as steam is delivered into and passes through it, condensation, with reduction in temperature and pressure, begins. The good qualities of any boiler can be completely neutralized by unprotected delivery pipes for the steam.

We illustrate here the sectional insulated air covering for pipes, as manufactured by Messrs. Shields & Brown Co., of 143 Worth St., in this city. The covering is composed of alternate layers of asbestos sheathing and corrugated and plain soft wool felting. The layers of felt are sewed together with a tape running in and out through the whole thickness. The tape is saturated with paste, and thus not only sews, but pastes them together firmly. The paste is allowed to dry, when a longitudinal cut is made through the center of this cemented slip. The effect of the combination is obvious. A porous structure full of air cells, the best non-conducting combination practical, is thus secured.



SECTIONAL INSULATED AIR COVERING FOR PIPES.

The covering is made up in three-foot sections, each forming a hollow cylinder, split or cut longitudinally. The consistence is such that it can be sawed as desired with a fine-toothed saw. Its durability is insured by the large proportion of asbestos contained. With the covering the makers supply staples and strips and bands of wool felt. To put it on the pipes it is sprung over them, the edges are drawn closely together by band, or by a strap or rope. Staples are then driven in across the seams to secure them. After a few hours' standing to allow of any shrinkage, the edges are driven together and a strip is pasted over the seam. Bands are pasted around the joints between the sections.

Elbow, tee, and globe valve coverings are supplied also. Nothing can be neater in appearance than pipe thus covered, while the non-conducting qualities are unsurpassed. For putting it on, no tools are required except a hammer, a fine-toothed saw, a sharp knife, some thick flour paste, and paste brush. Any workman of ordinary ability, with, if necessary, a little "looking after," can apply it successfully. When applying to steam pipes, it is better to have the heat on, so that all shrinkage and conformation to the shape of the pipe may take place at once.

While our main reference has been to steam pipes, it should be remembered that the same qualities which make this so excellent a cover for them render it also an efficient protector for water or gas pipes, to prevent them from closing by the cold produced by frost. No greater annoyance than that produced by such occurrences exists, and in using such a covering as we describe, householders and others can save themselves much trouble.

The firm's Western address is 78 and 80 Lake Street, Chicago.

THE NEW ERA RADIATOR.

We illustrate in the cut a recently invented radiator which will, we are sure, be of peculiar interest to our

THE NEW ERA RADIATOR.

readers who are interested in building. No fact is better known or has been more often commented on than the great waste incidental to the present system of burning coal, where sometimes ninety per cent. of the heat goes up the chimney, the remaining ten per cent., in the form of radiant heat, giving the room all the benefit it receives from the uneconomical arrangement. Various efforts have been made to save this great waste, and various measures of success have been accorded them.

In the New Era radiator, an intelligently devised arrangement for this purpose is presented. A compact combination of drums and flues, it is made to take the place of a section of stove pipe. The heads are of cast iron, the rest of heavy sheet iron. Its weight is between thirty and thirty-five pounds. The smoke and hot gases from the fire enter the lower drum, pass up the annular smoke flues to the upper drum, and then escape. On passing through these annular flues, the gases are deprived of their intense heat. It is imparted to the metal of the radiator. This has a number of air pipes running from top to bottom. These heat the air, which pours into their lower openings comparatively cold and out of their upper ends warm and agreeably heated. Thus the lower stratum of cold air that lies along the floor, and is the cause of so many colds, is made to circulate upward, and is heated.

It may be connected at any point in the line of the stove pipe. Thus a pipe may be carried through a ceiling, and the upper rooms heated by the radiator without any extra consumption of fuel whatever. By placing it on the stove pipe in the same room with the stove, the efficiency of the stove will be greatly increased.

The New Era radiator is as easy to clean as a stove pipe, has no horizontal obstructions to catch soot, is gas tight, and, while effecting the large saving in heat, does not injure the draught. It is stated that nearly fifty per cent. of the fuel burned can be saved by it.

It is manufactured only by the firm of Wilmot Castle & Co., 177 to 193 West Main Street, Rochester, N. Y.

Shingle Stains.

A prominent French paper on architecture speaks of the advancement in America over European countries in the effect of color on the outside of the country houses. It says the effect from the use of stained shingles gives a certain finish to the architecture of a house which cannot be given otherwise.

At first the use of poor stains for outside work discouraged the architects, as the stains washed off and faded out, but since the Dexters' English shingle stains have been used, it has given a new impetus to the whole profession. Cheap stains of a chemical nature, which claimed that dry rot could be avoided by their use, faded out from the contact of color, and the chemicals used and washed off, because the liquid base of this chemical stain was water, which is proved by the freezing of such stains in the winter months.

The Dexter English shingle stains are wholly of an oil nature, containing no "*dead oil*," and are colored by the use of pure English ground pigments.

They are now used by the best architects, and Dexter Brothers show testimonials of architects who have done the best and largest work in Newport, Bar Harbor, Lenox, Boston, New York, Philadelphia, and it is now being used throughout the entire West.

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Rosenberg's Finishes.

E. H. Jemison, representing the United States Treasury Department, has written a letter "recommending the use by the department" of Rosenberg's Elastica Finishes. He says he found them to be "as represented in every respect," and "very superior in finish to those we are now using."

Effects of Snow on Marble.

The results of the examination of snow taken from different places in Munich and its neighborhood, by Mr. Sendtner, says the *Pharmaceutical Journal* (London), would seem to indicate not only that snow has a considerable faculty for absorbing sulphurous acid from the atmosphere, but that the absorption goes on continuously for some time. Mr. Sendtner ascertained that, on one day when snow fell, sulphurous and sulphuric acids were present in it in fairly equal portions, but on the second day almost all the sulphurous acid had been ozonized to sulphuric acid. In the vicinity of chimneys and gas works the absorption would, of course, be greater. This great absorptive power toward sulphurous and sulphuric acids is considered of practical interest, as explaining the destructive influence of snow upon marble.

THE "ALERT" DOUBLE ACTING HAND FORCE PUMP.

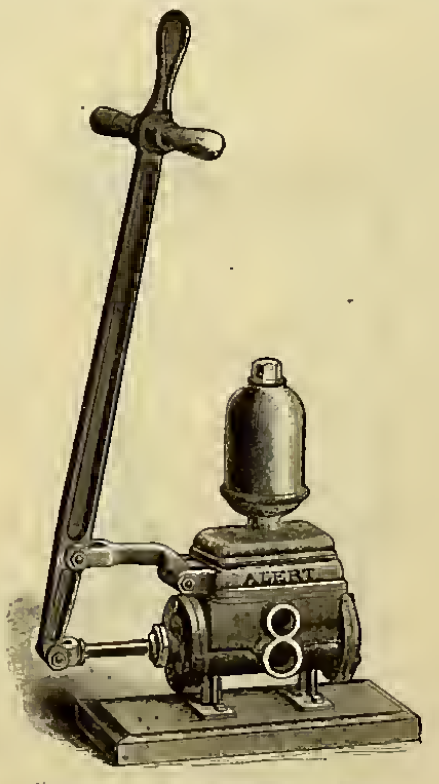
For house use in country neighborhoods a hand pump, easily repaired, with valves readily accessible and with silent action, has long been a desideratum. In the pump we illustrate, made by The Goulds Mfg. Co., of 60 Barclay St., New York City, these points are all attained. The pumps are built at the extensive factory of the company at Seneca Falls, N. Y.

The direct acting lever and piston rod have been adopted in place of the old-fashioned rock shaft. This leaves only one stuffing box to be packed instead of two. On each side of the pump are two openings threaded with iron pipe thread. These are the suction and discharge openings. The object in having them on both sides is obvious. It permits almost any connections from cistern or well and to the tanks to be adopted.

To insure quiet working and save jarring the pipes, which is a frequent cause of leakage and of loosening the joints, an air chamber is placed on the upper side of the valve chest. This cushions the water so that a comparatively even stream is delivered into the house pipes.

On top of the air chamber is a heavy brass nut. This, when unscrewed, permits the whole pump to be taken apart. At once the valves, both inlet and outlet, are exposed on removal of the air chamber and cover of the valve chest. In this operation the suction and delivery pipe connections are undisturbed. This point is of no little importance, for once such joints are made, it is of the last importance to leave them undisturbed.

The pump is very light and small. It occupies a floor space of only eight by twenty inches, and can pump against any pressure up to 100 lb. per square inch. It is in general built on the lines of a steam pump. In their specifications for country residences it is the style now prescribed by architects. Several



"ALERT" HAND FORCE PUMP.

reasons besides those detailed make it the best for this purpose. Thus by its double discharge it may be arranged to pump either into a tank from one side or directly from a faucet connected to the other. This provides for a fresh supply for the culinary wants, while the main water system is kept supplied from one or more tanks fed from the other side.

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THE SHAKESPEARE MEMORIAL AT STRATFORD-UPON-AVON.

The American veneration for the birthplace of Shakespeare is well known, and it has just taken practical shape by the presentation to the town of a public drinking fountain and clock tower, the gift of an American citizen, Mr. George W. Childs, of Philadelphia, in commemoration of the jubilee of Queen Victoria. The memorial has been erected in Rother Street, a broad open space near the center of the town, where several thoroughfares converge, and where the annual statute fairs or "mops" take place. The structure is handsome and imposing, and is built of Peterbead granite (for the fountain) and of hard freestone (for the clock tower). The base of the tower is square, with projecting buttresses at the four corners, terminating in acutely pointed gablets, surmounted by a lion bearing the arms of Great Britain alternately with the American eagle and the stars and stripes. Appropriate inscriptions are engraved on the four sides of the memorial. The tower terminates in a spire, beneath and surrounding which are smaller spires and turrets. The whole height of the structure is fifty feet. The architect is Mr. Jethro A. Cossins, of Birmingham. The ceremony of inaugurating the fountain was performed on Monday, October 17, by Mr. Henry Irving, in the presence of the Mayor (Sir Arthur Hodgson, K.C.M.G.), the corporation, and a distinguished company of visitors. Sympathetic letters were read from Mr. J. Russell Lowell and Mr. Whittier; and speeches were delivered by Mr. Irving, by Mr. Phelps, the American Minister, Mr. Walter, of the *Times*, Sir Theodore Martin, and others.—*London Graphic.*

THE SHAKESPEARE MEMORIAL AT STRATFORD-UPON-AVON.

Optical Refinements in Architecture.

Many architects look upon all refinements of line and curve as so much waste time, and would as soon think of referring to the original Latin of Vitruvius for rules in proportioning their rooms as to consult and apply the corrections of the Parthenon to their buildings. In sketching out his design to a small scale on a sheet of Whatman's drawing paper, the architect does so without any further thought than to produce a convenient plan or a well grouped elevation. Any infinitesimal correction to the straight line or entasis would be inappreciable to the naked eye on the surface of paper the inequalities of which would render it worthless; nor does he take much trouble in the proportions of his rooms, so long as they look right and fit well. If such refinements are to be made, they should be shown in large drawings, or set out to the full size on the works by proper rules and other instruments. The task is laborious and troublesome, and contract prices are little in sympathy with such niceties of adjustment. Even of the more practicable mode of adopting certain ratios and proportions, the architect does not avail himself very much.

We do not say that every horizontal beam—such as an entablature supported by columns at intervals—ought to be "corrected" by the application of a parabolic curve, or that every string course and cornice should be arranged to curve or bend upward; but we contend that these refinements ought to be made in interiors wherever the lines are long, and contrasting lines and surfaces occur in juxtaposition; that they are, in truth, applying precisely the same principle of correction as the colorist or decorator would apply when he takes care to juxtapose two colors or shades which shall be complementary to or harmonize with each other.

It is painful to witness in modern buildings a perfect ignoring of these principles of design. We go into a public hall or concert room, and take our seat. The flat coffered ceiling appears to be literally bending or falling upon our heads. To make the impression still more apparent, the architect has introduced a circular or flatly curved arch over the orchestral recess. If the ceiling is a flat curve, as it often is, the trusses are, perhaps, brought down below and incased, their lower edges being made perfectly horizontal, the two lines serving to increase the difference between them; in other words, to make the trusses look as if they were deflecting.

Mr. Pennethorne, some years ago, showed that the masses of the temples of Athens and Rome were designed on perspective principles—that is to say, the masses and many of the details were designed as they were intended to be viewed. The point of sight was always before the architect—that is to say, he studied the effect of his entablatures, abaci, and other masses of details from points of view that were likely to be frequented. It is well known that the various sections through the Doric capitals, the mouldings, and other parts of Athenian buildings, were composed of different arcs of the conic sections. Mr. Pennethorne says that the Greek entablature is perspectively proportioned and arranged to suit the given points of sight thus: The apparent height of entablature is measured in seconds upon the arc of a great circle. "Then, dividing this whole apparent height into some given number of aliquot parts, measured also in seconds, the apparent height of the architrave, of the frieze, and cornice will, in each case, be a multiple of this given modulus. Again, by dividing the first modulus into a given number of apparent aliquot parts, a second modulus is obtained, by which the apparent heights of all the details of the cornice of architrave and frieze will be regulated, and the true lineal heights are then all determined by trigonometrical calculations." In short, all the visible heights of features are, upon this principle, regulated from a given point, the real elevational height of each part being afterward found.

This system of proportion would probably entail too much labor upon the architect to work out with any accuracy, and may be looked upon as chimerical. But we see instances every day of positive ignorance of these principles, especially in the designing of mouldings, projecting features, and towers. If the architect is too impatient to make nice corrections in the manner we have pointed out, he ought at least to take the trouble necessary to regulate his heights and masses before inking in his elevations. Sketching in perspective is a valuable auxiliary in designing roughly the masses of a building; but some more accurate method is required in perspectively setting out the heights of stories, entablatures, parapets, towers, and other features. This can only be done by adjusting all heights from a given point of sight, or upon the arc of a circle described from the said point. An elevation is misleading, as every architect knows who has suffered disappointment after the building is finished. It only gives vertical heights, which may be very much curtailed or foreshortened in the actual view of the building from the opposite side of the street, for example.

Many towers and spires have been spoiled by designing them in elevation instead of at the angle. In broach spires we find a want of care in one particular above the others. The broach is designed on the level. The hips of the broach are made to look gentle in elevation, but when raised above the eye 60 or 100 feet, they become so depressed as to give a very ungraceful and abrupt springing to the spire.

We may instance the want of entasis to spires and columns. Every one who has a critical sense of vision must have observed the apparent weakness there is in a spire that has perfectly straight sides, when compared with one which has been entasised, and the same with all columns. Here also the method to insure the correction can be easily applied. The more important of these refinements are capable of being made at the initial stage of design, without recourse to decimals of two or three removes from the decimal point, or to mathematical calculations.—*Abstract from the Building News.*

Testing Pile-Protecting Compounds.

In 1882 several piles, coated with various patent anti-teredo coverings, were driven in the harbor of San Francisco for the purpose of testing them. Recently Engineer Manson began pulling up the piles in order to see the result of the experiments. A pile coated with Pearce's compound, composed of paraffine, limestone, kaolin, etc., was found to be completely honeycombed by the teredos. The eucalyptus and cedar piles were also nearly destroyed. In 1884 the two piles incased by A. W. Von Schmidt in sewer pipe and cement, the twenty-three coated by Frank Shay with asphalt and wire cloth, the ten of McKeon & Co., coated with warm cement containing a poisonous substance, and those of W. H. Hayes, coated with Portland cement, etc., were examined by Colonel Mendel and Mr. Manson. All showed signs of having proved failures. The insect is ahead of the inventors up to date.

A Tower on the Mount of Olives.

The tower which is being erected by the Russians on the highest point of the Mount of Olives is already several stories high, but one more is to be added. The object is to make it so high that both the Mediterranean and the Dead Sea may be seen from the top. A number of bells will be placed in the tower. In digging the foundation, several Christian graves were found, together with an inscription in Greek, in which the word "Stephanus" could yet be deciphered.

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NEW YORK, DECEMBER, 1887.

THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid **Magazine of Architecture**, richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued, and many others are in process of construction.

All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' Announcements is also given, in which the most reliable and approved Building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

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TO OUR READERS AND PATRONS.

The present number closes our fourth volume and brings us to the end of another year. Many subscriptions now terminate, and we ask our patrons to be prompt in sending their renewals, thus avoiding the loss of any numbers. The terms are only $2.50 a year.

Considering the wealth of illustration, the variety and value of information presented, this work is by far the cheapest of anything in the same line.

To builders, and those contemplating the erection of dwellings or other structures, our paper has proved to be of great value.

With every number, during the past two years, we have given plates in colors of many new buildings, with specifications, accompanied by extra special sheets of details. In most cases these have been so complete as to enable the builder and contractor to proceed at once with the construction; and on the plans thus presented, thousands of new buildings have been erected in all parts of the country. In almost every town in the land attractive dwellings are now to be seen, which, on inquiry, will he found to have been built from SCIENTIFIC AMERICAN plans.

No architectural publication in the world presents to its patrons so many practical specifications and drawings without cost, except the merely nominal subscription rate of $2.50 a year. It is hardly necessary to remind the builder that he would be obliged to pay several hundred dollars if the same number of plans were to be specially prepared for him.

In addition to the colored plates, details, and specifications, we have furnished a large number of other new architectural illustrations and many pages of valuable information. In all, the past year's volumes include about one thousand engravings.

We remind our readers of these items with the hope they will mention them to their friends, and, if possible to secure a new subscription, to send it in with the renewal of their own.

Our aim is to improve and enlarge the sphere of work, rendering it more and more valuable. To this end we need the support and encouragement of as many subscribers as possible. If each one of our friends will do a little for us in this direction, all the parties concerned will derive benefit.

If any of readers have inquiries to be answered, or suggestions to make, relating to subjects or features they would like to see treated in our paper, we shall, at all times, be pleased to hear from them.

Architects and builders who desire to see their plans reproduced in our pages are also invited to communicate with the editor.

A CORRECTION.

In our November number an error was made in the estimate given for the $2,500 house illustrated in our colored plate. The cost should have been stated at $3,400. In some way the bill for mason work and painting was omitted. These additions and other modifications bring the cost up to the above sum.

A SUBURBAN RESIDENCE.

One of our colored plates this month represents a suburban dwelling built of dark trap rock, trimmed with buff brick, and roofed with ornamental stamped iron plates. It is now being constructed in New Jersey, by days' work, at a cost of about $9,250. The following is an abstract from the

SPECIFICATIONS.

MASON WORK.

Excavating.—Excavation under the entire house to a depth of about 4'.

Cellar Walls.—Cellar walls built of good sized trap rock. All necessary bluestone sills, cellar steps, and copings, fine tooled brownstone steps for stoops, also fine tooled brownstone sills for the doors and windows above cellar.

Walls.—All stone walls above cellar are medium sized trap rock and well selected, pointed with black mortar.

Brick Trimmings.—Buff brick used for trimmings, as shown on the plans, laid in mortar same color as brick.

Chimneys.—Chimneys built of trap rock and buff brick, and topped out as shown on the plans.

Fireplaces.—Fireplaces built where shown, of white fire brick, and the hearths laid in tile.

Stone Steps.—Stone steps from main entrance to ground.

Porch Floor.—Porch floor is cemented with Portland cement.

Cementing.—The entire cellar bottom is cemented 3" thick with concrete and Portland cement.

Plastering—The entire first and second stories are plastered three-coat work, hard finished. Cornices in principal part of first story and second story hall. Center pieces in rooms to correspond.

CARPENTRY.

Timber.—Timber all well seasoned spruce. Floor timbers, 2×10", 12' on centers. Studding, 3"×4". Main rafters. 2"×8", 24" on center.

Cornice.—The cornice is formed of wood heavily moulded.

Roof.—The rafters are covered with hemlock boards, then covered with ornamental iron plates laid on tar felt. Valleys and gutters, XX tin. Leaders, galvanized iron. The ridge is ornamental iron work.

Floors.—The floors throughout are double. The upper floors are narrow white pine, except hall and kitchen. The hall is narrow oak, the kitchen narrow white maple, the bath rooms are white maple. The main hall is paneled wainscot, 4' high. Kitchen and bath rooms wainscoted with narrow beaded strips of maple. The trimmings throughout, except main hall, will be selected white pine. Hall to be of white oak. Doors to be six paneled. Main stairs and balustrade to be white oak. Others stairs white pine, with Georgia pine treads. Inside blinds throughout. Plain bronze hardware on principal part of first story. Jet and bronze for balance.

Painting.—The wood and iron work on the outside will be painted three coats. The inside will be wood filled and have two coats of hard oil.

Plumbing.—The apparatus for plumbing work located as shown on the plans. To be piped and arranged for water pressure.

Range.—The kitchen to have an approved low down range, fitted in fireplace.

Heater.—There will be placed in the cellar a No. 14 combination steam and hot air heater.

ESTIMATE OF COST.

Mason work, complete	$4,400
Carpenter and roof work	3,400
Painting	200
Plumbing, gas pipes, etc.	650
Steam heating	600
	$9,250

A LARGE CONTRACT FOR ROOFING PLATE.

The interesting picture of the Western Tennessee Hospital for the Insane, at Bolivar, in that State, which will he found in our advertising pages, will command the attention of humanitarians and administrators everywhere. Such buildings, devoted to such purposes, are not frequently to be met with. The announcement made in connection therewith, that the Alderly brand of square Terne plate was selected by the commissioners for the roof, gutters, and valleys of the structure, requiring over 1,000 boxes of roofing plate, presents, in a forcible way, the claims of that article. It is manufactured and sold by Messrs. Gummey, Spering, Ingram & Co., of Philadelphia, Pa., and Liverpool, England.

A DWELLING OF MODERATE COST.

This cottage is built in Plymouth Park, Buzzard's Bay, near Wareham, Mass., one of the most charming locations on the New England coast. From the veranda a beautiful view is obtained of the bay and coast. The cottage is erected on one of the knolls (which is one of the features of the park), and has for a background a grove of pine and oak trees. The shingles are treated with "Cabot's creosote stains" of the following colors: On roofs, a steel gray, and on sides, sienna. The clapboards are painted a light olive green and trimmed with bronze green and Indian red. The studs of hall, dining room, and parlor are exposed, and together with underboarding and beams overhead are planed and sandpapered, and all woodwork is given two coats of shellac of light finish. The second floor is plastered (sand finish). The contract price for cottage was $2,800 complete. The architect is Chas. E. Miller, 149 Broadway, N. Y.

SPECIFICATION.

GENERAL CONDITIONS.

The contractor is to give his personal superintendence to the work, and to furnish all transportation, labor, materials, apparatus, scaffolding, and utensils needful for performing the work in the best workmanlike manner, according to the true intent and meaning of the drawings and these specifications, which are intended to be co-operative, and when anything is shown on plans and not mentioned in specification, or *vice versa*, the same is to be furnished as though it were both shown and specified. This specification and the drawings annexed are intended to include everything requisite to the proper and entire finishing of carpenter's, mason's, and plumber's work, and the same shall be furnished, notwithstanding every item necessarily involved in the above words is not particularly mentioned.

All work when finished is to be delivered up in an undamaged state, without exception, except where otherwise specified, all materials to be of their respective kinds, and all labor to be done in the best workmanlike manner, to the full satisfaction of owner. Should the contractor introduce, at any time, materials different from the sort and quality herein specified, the same shall be removed and made good at the contractor's expense.

The contractor will he held responsible for all portions of the work let to him.

The contractor shall make no alterations of the drawings or specification, but should any error or inconsistency appear in these, it shall be the duty of the con

tractor to duly notify architect, who will make proper adjustment. The contractor is to give to the proper authorities all requisite notices of the work in his charge, obtain official permits and licenses for temporary obstructions and pay all proper fees for the same, and to be solely answerable for all damage to neighboring premises or to the person or property of the public by himself or his men or through any operatives under his charge, whether in contract or extra work. Contractor is to protect his work from frost until building is finished, and is to cart away all rubbish and leave the whole broom clean. All drawings, etc., are to be returned to the architect, and are not to be used for any other building.

CARPENTER.

Scantling.—Sills over piers 6"×8", sills that rest on stone wall 4"×6", all to be halved and pinned at angles. Plates 4"×4", posts 4"×6", girts 4"×4", braces 2"×4", studding 2"×4". The studding of hall, parlor, and dining room to be planed and chamfered.

Partition caps 2"×4" to be planned in the above rooms. Soles 2"×4" as well. First floor beams 2"×8", 16" on centers. Second floor 2"×8", 16" on centers, and to be dressed when exposed in above rooms. Attic beams 2"×8", 16" on centers. All beams under partitions to be doubled and spiked. Trimmers ditto.

Main Roof.—Rafters 2"×8", 2' on centers. Valley rafters 3"×10".

Veranda.—Girders 4"×8", floor beams 2"×6", 2' on centers. Rafters 2"×6" (dressed). Posts constructed of studs. Hemlock boards and shingles. Veranda roof timber will be exposed and dressed, floor to be merchantable yellow pine, free from large loose knots, shakes, or sap. Balcony floors to be covered with heavy canvas and slushed over with matallic paint, to be graded away from wall of house.

Framing.—The house to be framed and braced in a perfect and substantial manner, and to be perfectly plumb and true. All beams to be spiked together where practicable, so as to form tie across building. All framing of beams to be with tenon and tusk. Roofs strongly framed and cross bridges, first and third tier of beams. Gutters on roof to be hung of galvanized iron. Veranda to be built in and lined with Merchant & Company's roofing tin (or plates). There will be three 4" galvanized iron leaders for main roof, and one in front for veranda. (See plans.)

Gables.—Construct gables as shown.

Roofing.—Cover all roofs with sawed pine shingles 6" ×18", three shingles to the lap. On main roofs these to be nailed on shingle laths; on veranda roofs, on spruce boards, underside dressed (as specified). Flashing of Merchant & Company's old method roofing plates. Flash around chimney, valleys, and junction of roofs with walls of house.

Walls.—The walls of hall, dining room, and parlor to be covered with good ⅞" pine boards dressed on exposed side; all other underboarding to be of hemlock of even thickness. Over this cover walls with felt paper, and then on first story cover paper with clear pine clapboards 5" to weather. Above felt cover paper with 6" × 16" sawed pine shingles not more than 6" to weather. Between partitions of hall, dining room, and parlor fit ⅞" pine boards, dressed on both sides, with ¼ round mould to keep panel in place; the sheathing on other sides of room dressed on one side; boards not more than 5" wide.

Bases.—Form base as shown of 1½" thick pine.

Casings.—1¼" thick and 2" wide.

Furring.—Fur out the walls of stairs to cellar (corner boards to be 4" wide, 1¼" thick; put on angle beads where necessary).

Outside Step.—⅞" thick riser, 1¼" thick tread.

Flooring.—First and second floors to be made of good T. and G. yellow pine in rooms over hall, parlor, and dining room; to be dressed on both sides; third floor spruce; all to be not more than 5" wide.

Partitions.—Set the partitions between hall, parlor, dining room, pantry, kitchen, and cellar stairs with 2"×4" spruce, studs dressed and chamfered. (*Note.*—This is to be done so as to make a uniform appearance in hall, dining room, and parlor.) Studs of all other partitions of hemlock. Construct woodwork between piers, as shown.

Interior Stock.—All the stock for inside finish to be best quality, well seasoned, smoothed, and sandpapered, and, unless otherwise specified, of white pine. Hardwood saddles for all hearths and door openings.

Architraves.—All doors and windows to have ⅞"×5" plain architrave with moulding and bead on ends. No splicing allowed.

Doors.—Front door to be 2" thick, of design shown (cherry). All other doors to have 1⅝" thick four paneled stock door (local manufacture), and, unless otherwise shown, to be 2' 6"×7' 6". The openings from hall to parlor and dining room to be: hall and parlor, 7'×7' 6"; hall and dining room, 6'×7' 6". Bases 6' high, moulded (in bed rooms, closets, and pantries).

Door Frames.—All door frames to have 1⅛" thick jamb, with stops nailed on.

Window Frames.—All windows, unless otherwise shown, to have box frames with pockets; sills to have sub-sill, upper sill, plowed, etc., and given proper pitch.

Sashes.—All sashes to be 1⅝" thick, with lights as shown, and to have moulded sash bars. All sliding sashes to be double hung, the best steel axle pulleys, hemp sash cords, and iron weights. Cellar windows to have plank frame hinged at top. Casements to be hinged and have spring catches.

Bath Room.—Sheathe up sides of bath tub, riser of water closet and basin, with clear white pine ⅝" thick; wainscoating of bath room of same stuff 4' 6" high with neat mould on top. Make a batten door under basin with catch, etc. Door in riser of and in top of water closet and bath to be black walnut put on with brass screws.

Closets.—Fit up closets, except as otherwise specified, with one shelf, and cleat under for books. Bed room in attic to be furred as shown.

Dressers.—Fit up dresser in kitchen of clear white pine, glass doors at top and drawers and cupboards under; dressers in pantry to be the same.

Blinds.—Provide and hang to all windows of first and second floors 1¼" outside blinds of two folds properly hinged, and having rolling slats.

Base Knobs.—To all doors, and to have rubber tips.

Hardware.—Butts.—All doors to be properly hung with japanned butts of requisite sizes. Locks.—The front door to be supplied with brass faced mortise, patent reversible front door knob lock with night work, with two keys to each combination, and brass striking plate. All other doors (except closets) to have 4" mortised locks, brass face and brass striking plate. Closets to have rim locks. All locks to have brass keys. Knobs.—The front door to have a plain 2½" round bronze knob, with bronze rose and drop escutcheon to match. All other knobs to be (black) terra cotta with bronze iron mounting, etc. Bell pulls.—The bell pull to front door to be bronze, to match front door hardware. Bolts.—The rear door to kitchen to have two barrel bolts; door to cellar one, doors to bulkhead to have brass padlock with staples, etc. Drawer pulls.—Drawers to have bronzed iron drawer pulls. Sash fasts.—All double hung windows on first floor to have Morris patent self-locking sash fasts, to be of bronzed iron. Put on patent fasts to all casements, windows. Hooks.—Put heavy, triple hooks of japanned cast iron to all closets, 8" apart. Screws.—All hinges, etc., to be securely put in place with steel screws of proper size. Bell hanging.—Put in a large gong for front door, properly connect with wire, etc.

Stairs.—Main stairs to have an open string moulded and nosing to return on ends and carried around well. Risers ⅞" thick, tread 1½" thick: tread and risers housed into wall string and treads plowed into risers; risers plowed into the underside of the tread. The outer string to be 1" thick, and beaded on lower edge. All to be of clear pine. The stairs to have cherry newel, 5" × 5", turned. Cherry rail, 2" × 3". Balusters, 3 on each tread, 1⅛ × 1⅛; all to be solidly put together and wedged. Cellar stairs to have 1½" thick strings, sawed to receive 1¼ treads; all of spruce. Attic stairs to have 1¼" strings, plowed to receive risers and treads; all of spruce.

PAINTING.

All shingles of walls and roof to be stained with Cabot's best creosote stains, of colors selected by architect. The clapboards to receive two coats of best white lead and linseed oil finish, in colors as directed.

Hardwood.—The newel, rail, and balusters to be filled with three coats of hard oil, rubbed to a dead finish. The studs and beams overhead in dining room, parlor, and hall to have two coats of shellac (or Wheeler's hard finish). All other woodwork the same.

Glazing.—All glass to be double thick American, of number of lights shown; all to be well puttied and tacked, thoroughly cleaned, and left whole and perfect. All small lights to have cathedral glass, selected.

MASON.

Excavation.—Excavate for all cellar wall piers, etc., as shown. Dump the earth where directed, and leave the premises clear after building is finished. Piers 3' below surface.

Cement, Lime, and Sand.—All lime used in the mason's work to be extra No. 1 Rockland lime. Cement, best quality Rosendale of approved brand. Sand to be clean and sharp, and all to be used in proper proportions.

Foundations.—Furnish all materials and build walls, unless otherwise shown, 1' 6" thick of stone laid in lime and cement mortar in equal portions, and clean, sharp sand in proper proportion; the whole to be well bonded and trowel jointed inside and out.

Hearths.—Hearths to be of Portland cement, with lampblack to give color.

Bluestone.—Chimney cap to be of bluestone in one piece, holes for flues cut in. Cellar stairs as shown.

Brickwork.—Brickwork of chimney to be selected, on exposed places jointed in red mortar, all to be hard, well burned brick. Build in register flue in kitchen breast where directed and 6" C. I. thimble where shown. Build in breast of chimney on second floor 5" C. I. thimble, 2' 6" from floor.

Trimmer Arches.—Turn trimmer arches over all fireplace openings.

PLASTERER.

Laths.—Laths to be best seasoned pine, free from all imperfections, laid ⅜" apart and breaking joint.

Plaster.—Plaster will be two coat work, the second to be white sand finish, well floated. The first coat to be best Rockland lime and clean sharp sand, well mixed with long cattle or goat hair, to be thoroughly worked and stacked, all to be well troweled and made perfectly true. Patch up and repair all plastering at completion of building.

PLUMBER.

Lead Pipes.—The lead pipes through to be AA lead pipe. The waste pipes to be heavy; all joints between lead pipes to be heavily wiped, and joints between lead and iron pipes to be made with brass ferrules wiped into lead pipe and calked into iron pipe with molten lead and oakum.

Iron Pipes.—Iron pipes to be heavy C. I. soil pipe, free from all imperfections, and of uniform thickness; thoroughly coated inside and out with coal tar. All joints to be calked tight with molten lead and oakum.

Drain Pipe.—From point marked on plans run a four inch C. I. pipe to roof, making all proper branches for water closets, baths, basins, tubs, sinks, and at roof to be capped with Smith's patent ventilating cap. At foot of this place a 4" running trap, with hole for cleaning out, and an inlet to run out under servants' water closet. All branches to be Y branches, 4" for water closet, and 2" for basins, sink, etc. Plumber to make connections with street pipe.

Lead Supply Pipe.—Run from point marked on plans a ¾" lead pipe. Place at the beginning of this a rough round way lever handle, stop and waste cock. Connect with main supply. From the ¾ lead pipe make all proper connections for water closets, tubs, baths, and sink with ⅝" pipe, all to be graded so as to empty at stock cock. In kitchen, over sink, put two cocks (lever handle), so as to control supply of hot and cold water to second floor, the same to empty in the sink.

Boiler.—Furnish and set where shown in kitchen a heavy 30 gallon galvanized iron boiler with stand complete. The boiler to be supplied with water through a branch of ⅝" lead pipe, and connect with water tank of range with a ⅝" extra strong lead pipe, the other part of boiler to be fitted up with ⅝" strong lead pipe with ⅝" sediment cock, and the required length of light lead pipe to empty into sink trap (boiler to have a safety attachment). Furnish and put on to supply to boiler in the most convenient place a ⅝" finished lever handled stop cock to control supply to boiler. From head of boiler run lines of ⅝" lead pipe to supply sink and tubs in kitchen, basin, and bath tub on second floor.

Sink.—Furnish and set up (and of size shown) a plain C. I. sink with slate back. To be set on C. I. legs, to be supplied with hot and cold water through ⅝" lead pipe, drawn through ⅝" compression bibb cocks, one hose, the other plain, wasted through heavy lead S trap calked into iron pipe as specified.

Tubs.—Furnish and set up tubs of size shown, supplied and wasted the same as sink, but to have brass plugs and safety chains. Tubs of wood well dovetailed.

Wash Basin.—Furnish and fit up (of size shown) in bath room a 1¼" thick Italian marble slab, countersunk and moulded on edges, backs 10" high, the slab to be fitted with a 12" marble pattern basin (overflow) well fitted to slab, with brass clamps, etc. The basin to be supplied with hot and cold water through silver plated compression basin bibb cocks (⅝), wasted through 2" lead pipe and S trap, silver plated basin plug and safety-chain.

Bath.—Furnish and fit up bath of size shown, 14 ounce copper tinned and planished, tub to be supplied with hot and cold water through ⅝" lead pipe, and drawn through ½" bath silver plated compression cocks. Wasted through 2" lead S trap. Silver plated plug and safety chain.

Note.—All lead S traps to have brass trap screws for cleaning.

Water Closet.—Water closet in bath to be a Demarest or Manhattan patent long oval flushing rim earthenware hopper, automatic seat, all complete, with waste preventing cistern, to be copper lined; supply through ⅝" lead pipe connected to main supply; to have heavy lust lead trap, properly connected with soil pipe. Connect from cistern to hopper with 1¼ light lead pipe so as to get good flush. The water closet for servants to be enameled iron hopper with cistern, etc., as above.

It is said that the ova of tapeworms are frequently deposited in the wrinkles of a lettuce leaf and near the mid rib of a cabbage leaf, and so it behooves those wishing uncooked leaves of any kind to have them carefully washed.

A FRENCH COTTAGE.

We publish herewith the plans for a house designed by M. A. Fatalot and erected by M. Valette, architect. It is built on the side of the terrace (Rue Babie), on the green hills which overlook the Seine.

The construction is very simple. The architect was, in fact, asked to use the strictest economy. The first floor, built over a cellar, consists simply of a vestibule, A, which opens into a dining room, C, a bed room, D, a kitchen, B, the water closets, E, and the stairway. The latter is constructed of wood and leads to the second story, which serves as both studio and drawing room. This room is lighted by the large window shown in our perspective view. The walls of the building are of stone—stone from Meudon, nicely colored—and Bourgogne bricks of different shades form the design of the frieze. The basement is of dressed stone; the pediments of the gables and the cornice are covered with a plaster of sand and mortar colored in imitation of stone. The tops of the pediments are decorated with Parvillee faience. The perron is of Bagneux stone and the mullions and supports of Euville stone.

The following is a detailed list of the expenses:

Masonry	$1,480
Carpenter work	265
Plumbing, etc.	166
Joiner's work	462
Locksmith's work	315
Heater, etc.	74
Painting and glazing	92
	$2,854
Salaries	200
	$3,054

A FRENCH COTTAGE—HOTEL DE PEINTRE, A MEUDON.

Our Forestry Problem.

According to latest estimates, we consume yearly, with our present population of sixty millions, not less than twenty billion cubic feet of wood. The amount is made up, in round figures, in the following manner:

2,500,000,000 feet for lumber market and wood manufactures;

360,000,000 feet for railroad construction;

250,000,000 feet for charcoal;

500,000,000 feet for fence material, etc.;

17,500,000,000 feet for fuel.

To this it will be safe to add, for wasteful practices and for the destruction by yearly conflagrations, at the least, twenty-five per cent.

The average yearly growth of wood per acre in the well stocked and well cared for forests of Germany has been computed at fifty cubic feet. Applying this figure to our present requirements, we should have an area of not less than five hundred million acres in well stocked forest to give us a continual supply of all kinds for our present needs. Now, a careful canvass made four years ago developed the result that the existing forest area in the United States, excluding Alaska and Indian Territory, comprised almost five hundred million acres (489,280,000); but it is well known to everybody who is acquainted with our forests that they cannot compare in yield with the average European Continental forests under systematic management. Much of what is reported as forest is useless brush land or open woods, and depreciated in its capacity for wood production by annual fires, by which the physical structure of the leaf mould is destroyed, and thus, too, its capacity for storing the needful moisture, reducing wood production, and killing all young growth.

Without care, without management, and left to the kind but uneconomical work of nature, interfered with, in addition, by rude and ignorant action of man, it is doubtful whether, on the existing area, one half the amount of wood is produced yearly which we now require. We have, therefore, beyond doubt, reached—if not passed—the time when increased drain means squandering of capital, and when regard to husbanding, to careful management, to recuperation of our forests, and planting of new forests is required for the purpose of merely furnishing raw material; and it should not be forgotten that to reproduce the quick growing white pine of an acceptable quality and sufficient size requires not less than eighty to one hundred years, and for the long leaved pine two hundred years; that, altogether, wood crops are slow crops; that nothing of size can be grown under a quarter of a century at the best.

That this is a business requiring intelligent national consideration is apparent. Not less so if we appreciate the magnitude of the values resulting from it. The total value of forest products in the census year was placed at $700,000,000, or ten times the value of the gold and silver production, five times the value of all coal and mineral production, and exceeding every one of the agricultural crops, corn and wheat not excepted; and representing in value about thirty per cent. of the total agricultural production.

Of injuries wrought locally by the reckless clearing of hill sides and of deterioration of the soil due to inconsiderate action of man, I could entertain you by the hour. The country is full of examples. Any one who wishes to study the effect of such denuding of hill sides upon the soil, the water flow, and agricultural conditions, need not go to France, Spain, Italy, Greece, or Palestine. The Adirondack Mountains are within easier reach, where the thin cover of earth exposed to the washing rains is carried into the rivers, leaving behind a bare, forbidding rock and desolation, while at Albany the Hudson River is being made unnavigable by the *debris* and soil carried down the river. The government has spent more than ten million dollars, I believe, and spends every year a goodly sum, to open out a passage over the sand bar thus formed.

Go to the eastern Rocky Mountains, or to Southern California, and you can gain an insight into the significance of regulated water supply for the agriculture below, and also learn how imprudently we have acted and are acting upon the knowledge of this significance by allowing the destruction of mountain forests in the most reckless and unprofitable manner. Along the shores of Lake Michigan, and along the sea coast, we are creating shifting sands by the removal of the forest cover, to make work for the ingenuity of our children in devising methods for fixing these sands again. The vegetable mould with which the kind forest had covered the alluvial sands of the southern coast plain we are taking pains to burn off in order to replace it with expensive artificial fertilizers.

That the great flood of the Ohio, which cost the country more than twenty million dollars, was entirely due to deforestation, I will not assert; but it must have been considerably aggravated by the accumulation of minor local floods, due to the well known reckless clearing of the hill sides, which sent their waters down into the river in torrents. At the season when the winter snows are melting, watch the newspapers, and you will find an almost daily mention of the disastrous ravages of brooks and streams, many of which injuries could have been prevented by avoiding the creation of their distant and indirect cause. Thus we may multiply examples all over the country, showing harmful local influences upon agricultural conditions due to forest devastation.

That the vast stretches of land in the Northwest, from which the white pine has been cut and burned off, present the aspect of a desolation which sickens the heart, you may hear from every one who has seen these deserts unnecessarily wrought by man. Every traveler in this country, be it to the White Mountains, to the Adirondacks, along the Allegbany Mountains, be it through the Rockies or the redwoods of California, cannot but be startled by the desolate, sad aspect of many of these once beautifully clad mountain crests.

And we are a nation hardly a hundred years old, with over thirty acres per capita to spread ourselves upon. What will become of us when we must live upon five acres per head? We are far enough advanced in our recklessness of disregarding the indirect significance of forest areas to have learned a lesson at home, and to feel the necessity of being more careful in the utilization of the forest, so as not to lose its protection for our agricultural and general interests.

The means for its solution I may only briefly indicate. They are education, example, encouragement, legislation. Some of these are of slow effect. Others can be made to give results at once. Let the United States government, which still holds some seventy million acres of the people's land in forests, mostly on the Western mountains, where its preservation is most urgently needed—let the government set aside these otherwise valueless lands, and manage them as a national forest domain, and then the first effective step, a feasible and not a forcible one, is made. Let the military reservations on the Western treeless plains, which are still in the hands of the general government, be planted to forests and managed as such. This would be no doubtful experiment, would interfere with nobody, would enhance the value of the surrounding country—and education, example, and encouragement are provided, as far as it is in the legitimate province of the general government. And such example, instead of costing anything to the country, can be made self-sustaining—nay, productive—and would add appreciably to the people's wealth.—*B. E. Fernow.*

Mortar containing sugar has been employed in building the new Natural History Museum in Berlin, and has proved far superior to common mortar. It sets almost with the firmness of a good cement, while mortar made with molasses became soft and brittle after a time. In Madras a mortar is used with which either sugar, butter or buttermilk, shellac and eggs are mixed. It holds well and takes a marble-like polish.

A RESIDENCE FOR $8,000.

The perspective and plans herewith presented are from the designs of Mr. S. W. Whittemore, architect, East Orange, N J. The general dimensions are: Front, 36 feet, exclusive of bay windows; side, 51 feet, exclusive of piazza and laundry. Height of stories: Cellar, 7 feet; first story, 10 feet; second story, 9 feet 6 in.; attic, 8 feet.

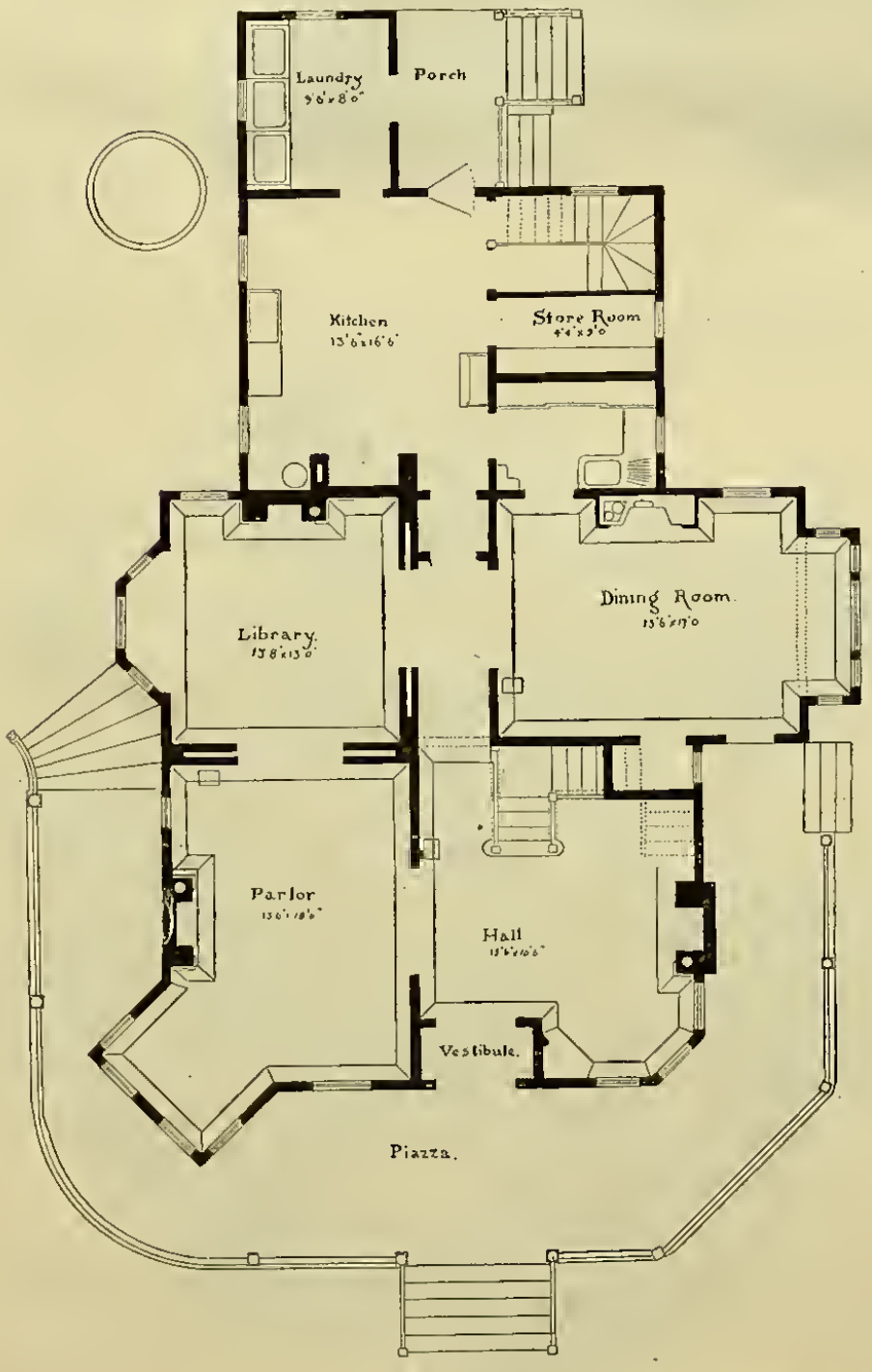
Materials.—Foundation, stone; first and second stories, clapboards; roof, shingles.

Cost.—$8,000.

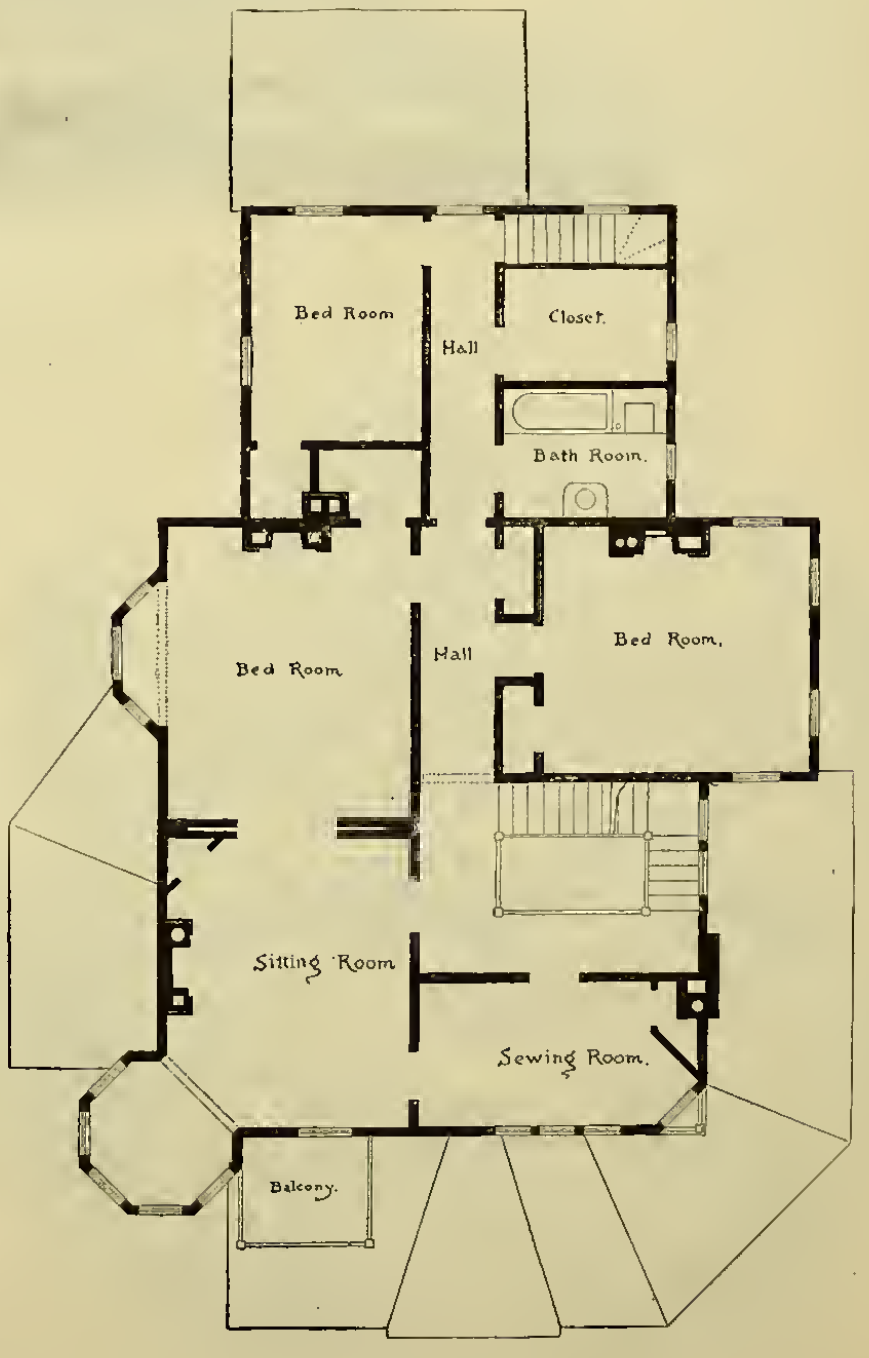
Fireplaces are provided in the dining room, library, parlor, and hall. The attic is finished throughout. Cellar under the whole house except laundry.

Bamboo Tree.

Writing from China, a correspondent says that the Chinese have developed the culture of the bamboo tree very wonderfully. They can produce a perfectly black as well as a yellow bamboo. The Emperor of China has one officer whose duty is to look after his bamboo gardens. This valuable tree is found in all tropical and sub-tropical regions, both in the eastern and western hemispheres. An attempt has been made in England, and with some success, to raise a dwarf species found at an altitude of 12,000 feet in the Himalaya mountains. The new world furnishes bamboo of the greatest diameter. The stems are usually very slender, but in the northwestern part of South America is found one species with a diameter of 16 inches. The Chinese put this plant to a greater variety of uses than any other people. Some kinds of it when it first shoots up from the ground are used as a vegetable as we use



First Story Plan.



Second Story Plan.

A RESIDENCE FOR $8,000.

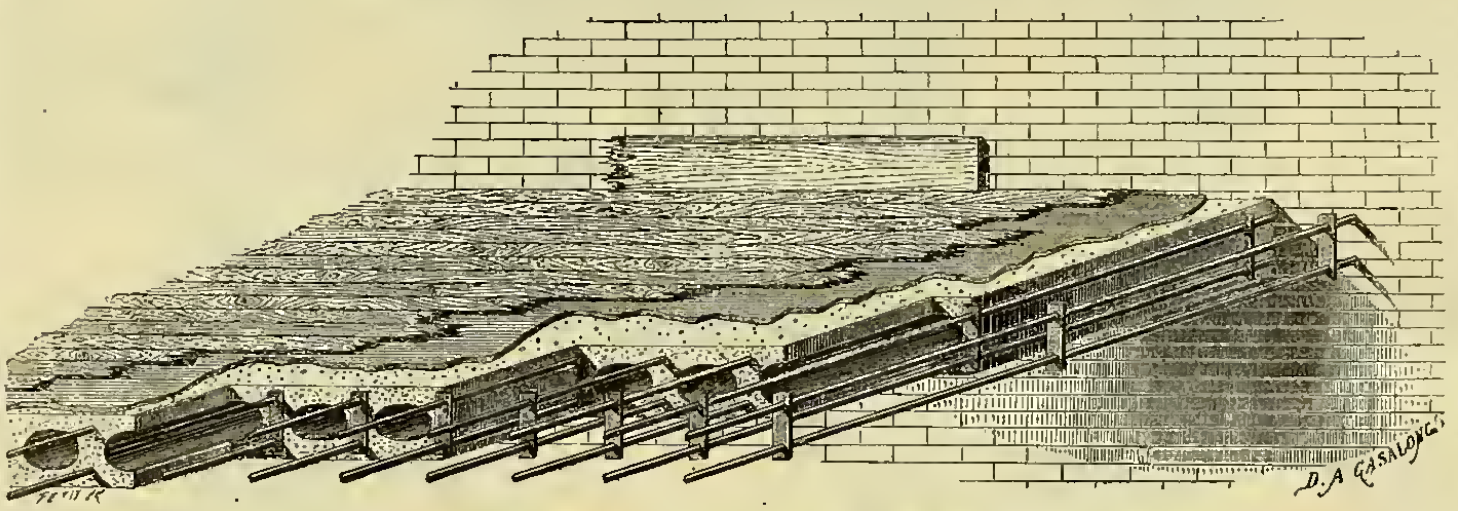
asparagus, or it can be pickled in vinegar or made into delicious sweetmeats. The plant has to be 30 years old to blossom, and then it bears a great profusion of seeds and dyes. These seeds may be used like rice, and a kind of beer may be made from them. In 1812 severe famine in portions of China was prevented by the sudden blossoming of a great number of bamboo trees. The stems of all the varieties are remarkably silicious One kind found in Java is so hard that it strikes fire when the hatchet is applied to it. This has only a very slender stem, which is polished and used as stems for tobacco pipes. This Protean tree furnishes material for houses, boats, cordage, sails of boats, telescopes, aqueduct pipes, water-proof thatching, clothing, water wheels, fences, chairs, tables, book cases, boxes, hats, umbrellas, shields, spears, and paper. The pith is used for lamp wicks, so there is no part of it that cannot be used for something. From some of it exquisite carvings inlaid with gold and silver are cut, that exceed in beauty the ivory carvings for which the Chinese are so famed. Recently it has been put to another use. Mr. Edison has found that the carbonized fibers of the bamboo furnish the best material for the incandescent electric lamp, and has made use of it in his system of lighting. In Burmah and Siam whole cities are built from bamboo. These houses are made in pieces, lashed together, and raised on posts several feet high.—*The Lumber World.*

FIREPROOF STRUCTURES.

An article recently published by us apropos of the Opera Comique catastrophe has brought us several interesting communications, and, among them, one from Mr. Hennebique, one of the designers of the 948 foot Belgian tower. Mr. Hennebique has established the fact that structures in which iron is used in the flooring do not arrest the ravages of fire, but fall even more quickly than those in which wood is employed.

In fact, the beams that support the ceiling joists, flooring, and laths, naturally combustible materials, are raised to a high temperature, and, becoming red hot, bend under their own weight, and at the same time shove the walls outwardly.

The flooring of Mr. Hennebique's invention, which is composed of a cement made of coal ashes, plaster rubbish, and hydraulic lime, is refractory enough to resist the heat developed by combustion.



HENNEBIQUE'S FIREPROOF FLOORING.

As may be seen from the figure, this flooring consists of tubular girders resting upon very simple metallic anchorages. These girders are of the composition above described, and thus constitute a sort of monolith upon which any sort of a floor can be laid—terra cotta, marble, wood, etc.

Aside from its being nearly completely incombustible, this sort of flooring presents a great advantage, from an economical standpoint, in consequence of the rational utilization of the materials employed. It is unnecessary to say that the metal is perfectly protected against oxidation.

Another advantage of this flooring is that it almost entirely prevents the propagation of sound.

As may be readily seen, this mode of construction is applicable to different uses and to every possible sort of decoration, such as cornices, compartment ceilings, girders of various styles, as well as pillars, pilasters, columns, and supports of every shape and every resistance.—*Chronique Industrielle.*

Construction of Chimney Flues.

In a letter to the *Insurance World* Mr. Thomas Boyd, architect, of Pittsburg, Pa., gives the following practical information:

I have had considerable experience in examining buildings burned by fire, having been associated with my father for eleven years, and during that time have examined hundreds of buildings destroyed by fire. I have traced more fires to the cause of defective flues than to any other source, and I could refer you to buildings, not only in this city but in others, where fires have occurred from this cause, and the insurance men and the public in general stated that the fire occurred from "unknown causes," as it was first seen many feet away from the flues.

In seventy-five cases in one hundred where fires occur from "unknown causes," it can be traced to defective brickwork. Ordinarily, an architect specifies that the brickwork shall be well slushed, and that the flues shall be well pargeted or plastered on the inside. This is a great error, as no flues should be plastered on the inside, and no walls having flues in them should be slushed, as the term is generally understood.

The flues should in all cases be built smooth on the inside, and all the joints should be filled full of mortar, the vertical joints as well as the bed joints. The lining of the flue or the four inches surrounding the flue should always be kept in advance of the brickwork, and the brick adjoining the lining and the second and third brick, and so on, should be shoved in soft mortar up against each other. This will fill all the vertical joints from bottom to top as laid. The slushing that is ordinarily put in from the top only goes down into the joint about ½ inch, thus leaving an opening the entire length of the wall, and in some cases an opening which a mouse could crawl through. As it is only a question of time when all the plastering that can be put on the inside of a flue will fall off, it will leave these vertical joints between the bricks open into the flue, and as the joists cross through these joints in the brickwork, fire is liable to take place ten or twenty feet away from the flue. I have taken down many old buildings in which these joints were filled with carbon or soot.

If the flues are built as above described, any competent builder or architect can find out whether the mechanics doing the work are slighting it or not; but if the inside of the flue is plastered or lined with terra cotta or any other material, you cannot tell whether the wall is properly built or not until this plastering falls off, which it will in the course of a few years. Thus all buildings erected with plastered flues are liable to burn at any time.

I have made a practice for a number of years of building flues without lining them, and then when the house is built, or as each story is erected, I put a dense smoke in the flue and close the opening at the top. If there is a hole the size of an ordinary pin head, the smoke will find it and penetrate into the interior of the wall adjoining the flue.

Roadside Plantations of Trees in Belgium.

The roadside planting of trees is carried out on a most extensive scale in Belgium, forming a marked feature in the landscape of that country. According to the report of M. J. Houba, State Head Bailiff or Ranger of Woods and Rivers in Belgium, recently published in the *Revue Horticole*, the total length of the highroads of Belgium in 1881 amounted to 4,227 miles, classified, as regards tree planting, in the following manner:

	Miles.
Roads already planted	2,417
" still to be planted	264
" which cannot be planted	1,546
	4,227

From this it will appear that, at the date mentioned, more than half the entire length of the Belgian highroads had been planted, and that the proportion would soon reach two-thirds.

The number of trees used in forming these plantations amounted to 871,685, representing in 1881 a money value of £415,986, the average cost of each tree when planted having been about 2s. 6d. The plantations had therefore at this date increased in value to nearly four times the amount of the capital originally expended upon them.

The trees principally employed in these roadside plantations (already made) are: Elms, 371,621; oaks, 130,828; poplars, 80,853; ash, 73,893; beech, 32,970; maples, 27,755; service trees, 24,630; Norway spruce, 43,767; larch, 41,699. It will be seen from this list that coniferous trees are largely used in Belgium for roadside planting. On the other hand, the report only gives 897 plane trees, 976 acacias, and 672 cherry trees, apple trees, and pear trees, showing that while the Belgian authorities fully recognize the great utility of these roadside plantations in other respects, they especially aim at the production of timber of good quality in a commercial point of view.—*The Garden.*

An Egyptian Temple.

An Egyptian temple appears to have been one of the most imposing assemblages of buildings that can be well conceived. Avenues lined with hundreds of sphinxes on each side led the worshiper to the sacred precinct for the distance of thousands of feet, and thus the mind, even when remote from the vicinity of the temple, received an impression calculated to excite veneration. This avenue was terminated by a stupendous mass of pyramidal form, above 200 feet wide and about 80 feet high, whose enormous proportion was naught diminished by the vastness of the plain in which it stands, nor by contrast with the mountains that overhung it. In the center of this propyleum is a door, flanked in advance by an obelisk on each side, about 90 feet high, and beside which are figures of colossal dimensions, 45 feet high, sitting as guardians of the sacred portal. The effect of the whole is gigantic, and calculated to impress the coming worshiper, with the fullest notions of his insignificance in the scale of material nature. The triumphal gateway being passed, a magnificent court meets the eyes of the beholder, having on each side a colonnade. And this court led to a densely columned hall or vestibule, under the shades of which the crowds of Egypt's sons and daughters reposed to recover from the exhaustion and fatigue caused by their journey under a burning sun to the fane of their creature god. And here the mind also dwelt awhile on the first impressions produced by the contemplation of the overpowering majesty of the gorgeous mass. For the huge propylea, which inclosed either end of the court, and the hall, with its forest of clustered columns, which the eye could not number, and the playful variety and copiousness of channeled hieroglyphics which left not a space uncovered, and the brilliancy of the pigment which gave an endless variety to the shafts and capitals of the columns, to the beams, the walls and ceilings, bewildered the attention, and left not a moment of repose to the wondering stranger. A lofty central avenue of columns, above 60 feet high, forming, as it were, a triumphal way, leads under a third portal, of dimensions by no means inferior to the others just mentioned, and marked with what care and with what sanctity the priests guarded every approach to the inner parts of the temple. But this gateway passed, and a scene the most sublime burst upon the view. An ample peristyle, much larger than the one already passed, presented itself to the eye, probably planted with trees, crowded with metaphoric statues.

On either hand a double avenue of columns, less for convenience than dignity of effect. In the center uprose the portico of the mass of building, that formed the temple itself—the columns in dimension more lofty, in decoration more rich, in proportion more graceful than those of the courts. The dynasties that had ruled over the country up to the period of the erection of this temple have their histories graven on the walls and on the columns. The same pyramidal form gives an appearance of endless durability to the mass, which is surmounted by an immense hollowed cavetto having the center occupied by the sculptured form of the agathodemon, or winged globe and serpents, with outstretched wings extending over the center intercolumniation of the facade, and seemingly a being of another world. Admitted beneath this portal, the minds of the worshipers are prepared for the gloomy inner penetralia, where every object was mysterious and emblematic. Numerous doorways closed by curtains succeeded each other, and led from vestibule to vestibule, which hindered the eye from penetrating with sacrilegious gaze into the inmost sanctuary, all access to it being forbidden to the multitude.

To these vestibules the light of day was denied, and the mind was subdued by the gloom of the spot, for the attention was absorbed by the contemplation of the sacred mysteries of the place and by the effects produced on the attention by the huge incongruous figures of granite—monstrous reflections of the gloomy minds of the religious inhabitants of the sacred precinct, who sought to deify matter and the animal instincts.—*T. L. Donaldson.*

The White Ash.

"About twenty years ago, Prof. J. L. Budd, of Ames, Iowa, advised keeping the seeds of the ash through the winter in kegs or boxes, mixed with clean moist sand, taking care that they become neither too wet nor too dry. Freezing will do no harm. The ground should be marked and prepared as for corn, and planting at the intersections, placing four to six seeds in the hill. They should be carefully cultivated, and the next spring thinned to one plant in each hill, the vacancies being supplied. By planting thus thickly, the young trees get a straight growth. At the end of six years every alternate row north and south should be thinned out, and at the end of ten years every alternate tree in each row. When twelve years old, on good soil and proper culture the first four years, the grove would have 12,000 trees on ten acres, averaging eight inches in diameter. By cutting the stumps close to the ground, and covering with a light furrow on each side, a second growth is obtained in eight or ten years, more valuable than the first."

Prof. C. S. Sargent, in speaking of this timber, says: "To develop its best qualities, the white ash should be planted in a cool, deep, moist, but well drained soil, where it will make a rapid growth. That the plantation may be profitable as early as possible, the young trees should be inserted in rows three feet apart, the plants being two feet apart in the rows. This would give 7,260 plants to the acre, which should be gradually thinned until 108 trees are left standing, twenty feet apart each way. The first thinning, which might be made at the end of ten years, would give 4,000 hoop poles, which at present price would be worth $400.

"The remaining thinnings, made at different periods up to 25 or 30 years, would produce some three thousand trees more, worth at least three times as much as the first thinnings. Such cutting would pay all the expenses of planting, the care of plantation, and the interest on the capital invested, and would leave the land covered with trees capable of being turned into money at a moment's notice, or whose value would increase for a hundred years, making no mean inheritance for the descendants of a Massachusetts farmer. The planting of the white ash as a shade and road side tree is especially recommended, and for that purpose it ranks, among our native trees, next to the sugar maple."

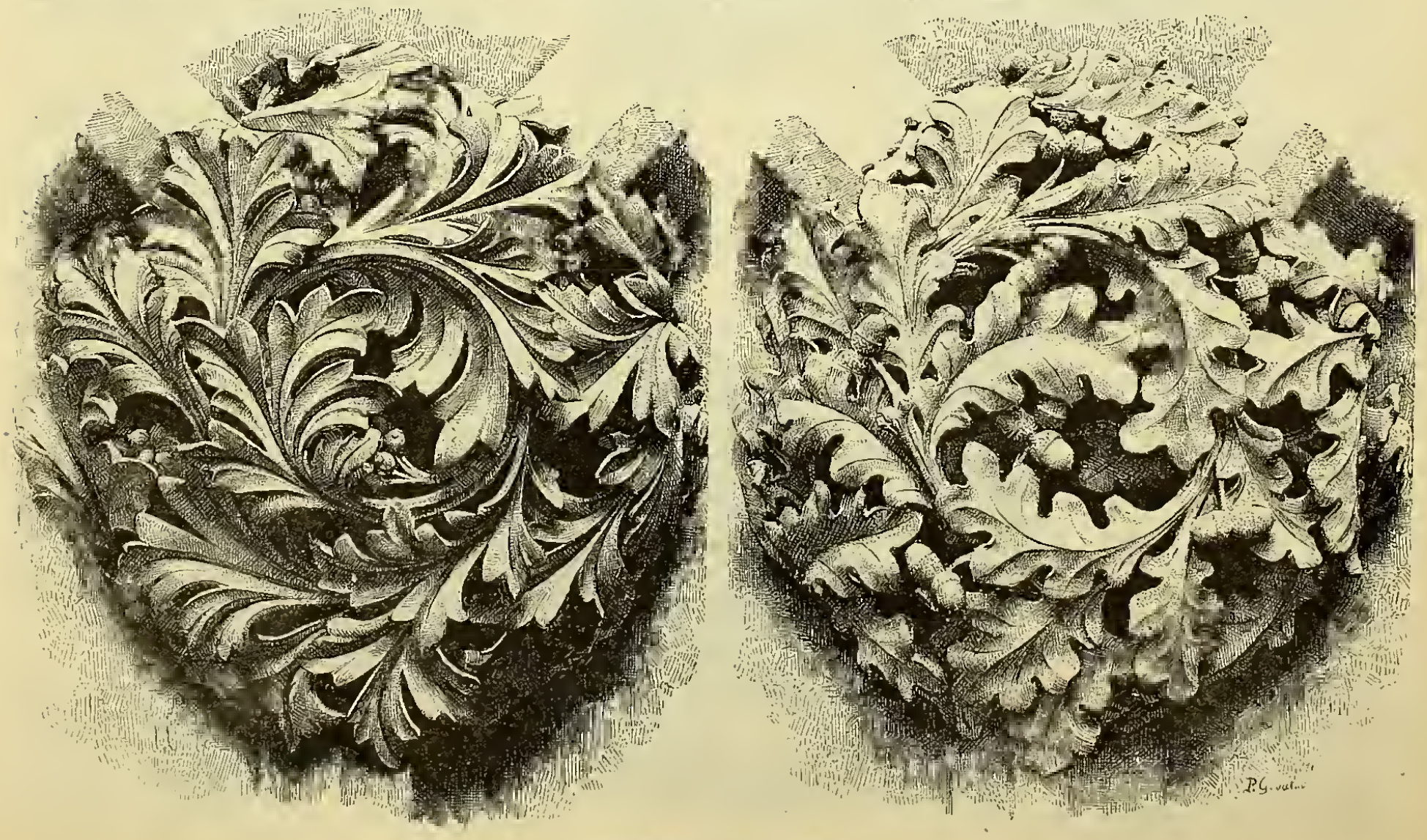
Prof. B. G. Northrop says in reference to this tree: "One of the most valuable of our native trees is the white ash, and, all things considered, it is one of the most profitable for planting. Combining lightness, strength, toughness, elasticity, and beauty of grain in a rare degree, it is in great and growing demand for farming tools, furniture, interior finishing of houses and railroad cars, the construction of carriages, for oars and pulley blocks, and many other purposes. The excellence of our ash is one secret of the preference given abroad to American agricultural implements. It is hardy, will bear the bleakest exposure, is a rapid grower and attains large size, but will not thrive on poor lands. It is every way superior to the European ash, much as that has been cultivated and lauded abroad. It is now found widely in the nurseries and young plantations attached to the forest schools of Europe. Director General Adolfo di Beranger, president of the Royal Instituto Forestale, at Vallombrosa, pointed me to his plantations of *Fraxinus Americana* with a tone which implied that is the tree of which Americans may well be proud.

"The ash is a fine ornamental tree for private grounds, public parks, or for the wayside. When planted closely for timber they grow straight and free from low laterals, and early reach a size that makes the thinnings valuable for poles and fencing.

"The seeds of the white ash are abundant, ripening by the first of October. They may be easily gathered after the first frost. If sown in the fall, they should be covered with three inches of straw. If to be sown in the spring, the seed may be mixed with damp sand."

Sawdust.

Sawdust has been a source of worry and expense to mill men in various ways, though it is to be admitted that in utilizing it to some extent as fuel they have in part solved the problem of its economical disposition. Lately, there has sprung up a certain demand for it, and the problem of its cheap shipment is now one that presents itself. A Yankee inventor has tried baling it, and appears to have devised a scheme that accomplishes the purpose successfully. He makes the sawdust into bales, and has progressed so far as to be able to compress thirty-two cubic feet, or a quarter of a cord, into a package three feet long by two feet on each of its sides. As this occupies only twelve cubic feet, the reduction is sixty-two and one-half per cent. of its original bulk. The machine used is nothing more than an ordinary hydraulic press, which is arranged in a manner similar to a hay or cotton press. The sawdust is pressed into bales and at the same time inclosed in a burlap covering, making a neat and easily handled package for shipment. Small pieces of wood, shavings, etc., may be baled with the sawdust or separately with equal facility. It appears a simple method of putting this bulky stuff in convenient shape for shipment, and it would seem might be employed to advantage wherever a market can be found for this species of mill refuse.—*The Timberman.*



ORNAMENTAL KEYSTONES.

DWELLINGS AT GLENRIDGE.

We illustrate a few of the tasteful residences which have been erected at Glenridge, N. J., a charming suburb of New York City, situate on the line of the Delaware and Lackawanna Railway. Glenridge is 14 miles from New York, and the time required for the trip, including the ferry across the Hudson River at New York, is about 40 minutes. The dwellings we have chosen for illustration have been recently erected. They vary in cost from $4,000 to $6,500 or more. We can supply on application such further information as readers may desire.

GLENRIDGE.

Fire Bricks.

Mr. W. Y. Dent, in a Cantor lecture at the Society of Arts, London, on building materials, gave an account of some of the chemical problems involved in the constituency of fire clay and fire bricks.

The plastic clays consist of silica and alumina chemically combined with water. They are hydrated silicates of alumina, the plasticity depending upon the water that enters into their composition. The water with which the clay is chemically combined can be expelled at a temperature a little above that of boiling, without detriment to its plasticity, but the whole of the water contained cannot be driven off without raising the temperature to dull redness. Silica, alumina, and lime are separately very infusible substances, and are capable of resisting exposure to very high temperatures without softening. It is on account of its extreme infusibility that lime is found to be the most suitable material for the cylinders upon which the oxybydrogen flame is made to impinge to produce a brilliant light, the intensity of the light being due to the extremely high temperature to which the lime is raised. Lime, however, from its want of cohesion, could never be brought into general use for such purposes as fire clay is employed, and this is also the case as regards silica, which requires the addition of some substance of a basic character, with which it will unite, and so cause the particles to bind together. The nearest approach to the use of silica alone as a fire brick is in the case of the Welsh brick, made from the Dinas rock in the Vale of Neath.

This material, before being made into fire bricks, had long been used for repairing the furnaces at the copper works of South Wales, for which purpose its peculiar property of expanding when subjected to the influence of a high temperature, instead of contracting, as in the case of some other fire clays, renders it particularly suitable, the cementation of the bricks being facilitated by the increase of temperature. This Dinas rock occurs in various conditions, from that of a firm rock to that of disintegrated sand, and a mixture of about 1 per cent. of lime is, therefore, necessary in order to make it into bricks. Dinas bricks will stand very high temperatures, but are more friable than ordinary fire bricks, and will not resist to the same extent the action of basic substances, such as furnace slags, containing much oxide of iron. They are, besides, porous and readily absorb moisture, rendering it necessary for furnaces built of them to be gradually heated, as they are liable to crack if sufficient time is not allowed for driving off the moisture. The composition of the clay used for fire bricks is a question of great importance, inasmuch as its quality depends greatly upon its chemical constituents, although its power of resisting fusion, when exposed to intense heat, is effected by its mechanical condition.

The same materials, when mixed together in the form of a coarse powder, will require a higher temperature to fuse them than would be the case if they were reduced to a fine state of division. The qualities required in fire bricks are that they should bear exposure to intense heat for a long time without fusion, that they should be capable of being subjected to sudden changes of temperature without injury, and that they should be able to resist the action of melted copper or iron slag. The Dinas brick, which contains 98 per cent. of silica, will bear exposure to a higher temperature than most others, but it will run down sooner when in contact with melted iron slag. Ganister is the name given to a fine grit which occurs under certain coal beds in Yorkshire, Derby, and South Wales, and the black ganister from the neighborhood of Sheffield is especially adapted for lining cupola furnaces, owing to its capacity to stand high temperatures without shrinking, in consequence of the large quantity of silica it contains.

Fire bricks made of silicious clays from granitic deposits in various parts of Devonshire also contain a large proportion of silica, but their powers of supporting exposure to high temperatures are materially increased by the coarseness of the particles of disintegrated granite of which they are composed. The material employed for the Dinas bricks, as well as the others mentioned, differs considerably in its character from what is ordinarily understood by the term fire clay, as used in the manufacture of the celebrated fire bricks of Blaydon Burn, Stourbridge, or Glenboig; the quality of which, as regards their chemical composition, depends upon the relative portions of silica and alumina, and their freedom from iron oxide and alkaline salts, the presence of which tends to render the clay more fusible.

Improvements in Making Portland Cement.

Clay is taken as dug from the pit, without being dried, and mixed with the usual proportion of lime, a portion of which is used as limestone, the remainder as freshly burnt lime. The burnt lime is first added in such proportion that the water in the clay exactly suffices to slake it, and the heat given out effects the necessary drying. The limestone is then added and the mixture ground in a mill to the usual degree of fineness, made into bricks, calcined, and the "clinker" reduced to a fine state of division as usual.

GLENRIDGE.

Typhoid Fever Carried by Well Water.

The following account of the transmittal of cases of typhoid fever by well water is sent us by Dr. Henry B. Baker, secretary of the Michigan State Board of Health. It is made to him by Dr. H. McColl, of Lapeer, Mich.

Dr. McColl reports: About September 1, 1887, Myron Gardner, railroad employe, came from the South sick with fever to his father's house. He was supposed to be malarial. No care was exercised with stools in the way of disinfection, but they were thrown into privy vault in rear of house, and in close proximity to well. Wash water was thrown on the surface of the ground, which was very dry at the time. About September 7 or 8, a copious rain fell and soaked the sandy soil; and on September 14, Wm. Gardner and wife, father and mother of Myron, and E. D. Gardner, a brother (who was a student in my office), and who boarded at home, were attacked with fever. On this day I got home from Washington, and found four of them down with a severe type of typhoid fever; and in two weeks Myron's wife and child were attacked; also a child across the street at Terry's, who had used water from the Gardner well; about the same time three cases in the Clifford house, south of Gardner's, who also used water from the Gardner well. None of the people from either of these houses were in the Gardner house. In the Walker house, still further south, one case has occurred, and I was at a loss to account for this case till a few days ago, when the young man said that at the mill where he was working they had used the Gardner water for a few days, owing to the disarrangement of the pump at the mill. Two others of the mill hands —Anderson and Lester—who used the same water were attacked about the same time. Lester is now convalescent. Anderson is dead, as also the child at Terry's. When I took charge of the cases, I ordered the discontinuance of water from the Gardner well and the disinfection of the stools, and no new cases are now reported. People who assisted to take care of the Gardner and other families, and who use water from other sources, have not been attacked. Clearly, Myron Gardner brought the fever home, the well became infected after the first rain from slops and privy, and the other cases got their seed from the water.

Dr. Baker adds: The foregoing instructive account of the way typhoid fever was spread, in one instance, is produced in the hope that it may lead others to trace the spread of this important disease, and, what is of greater importance, act intelligently for the prevention and restriction of the disease, as Dr. McColl did in this instance.—*Sanitary News.*

An Unsafe Church.

About a month ago, Inspector of Buildings Griffin discovered that the wall on the southern side of the Warren Avenue Baptist Church, Boston, Mass., was bulging. He climbed to the roof, and was astonished to find that the scissors truss that supported the pitch of the roof was not bolted together, but was fastened only with railroad spikes.

The wall was out of plumb fully nine inches. A peremptory order was issued to vacate the church. Then a more careful examination was made, with startling results.

The truss was laid bare, and then it was discovered that the sole support for the roof of the great building consisted of three iron rods one and one-half inches in diameter.

The cross rods were of no use, because the wood had shrunk away and the bolts could be rattled. The upper and lower chords of the truss were made of eight two-inch planks, and where the cross rods had been put through and clinched the auger had cut off one plank and part of another, weakening the truss by one-eighth.

The lower chord of the truss was cut completely through in two places. It is said that it will cost nearly $200,000 to repair the church, which is one of the largest in the city.

It would not be a bad idea for the trustees of other churches to have the trusses carefully examined.

Cedar Pavements.

To pave a city with cedar would seem to be a luxury, but it appears that in the city of Chicago, out of 277·71 miles of paved streets, there are 213·35 miles of cedar blocks, of which nearly forty miles was laid last year, and the Chicago *Tribune* says it is the cheapest pavement laid in the city. Dead cedar brought from the vicinity of Green Bay, Wis., was first used, but it was found that it did not wear well, and live timber is now required. The cedar is a tree which does not taper rapidly, and one of good size should furnish a stick 30 ft. long. The logs are brought here by boats in lengths of about 6 ft., with the bark still on, peeled, and cut into blocks 5 in. long. The blocks range in diameter from 3 in. to 9 in., and cost 50 to 60 cents a yard, measurement being made after they are laid. The process of paving a street with cedar blocks is much the same as was used with the Nicholson pavement. A sand foundation is first provided, and on this are laid boards which serve as stringers. On the stringers planks are placed parallel with the curb, and the cedar blocks are stood on end on the planks. The interstices between the blocks are filled with gravel and coal tar.

For the last three years block pavement has cost in Chicago from $1.00 to $1.30 a yard. The life of cedar block pavement is three to seven years, and it is an excellent pavement when first laid. It is believed by many to be detrimental to health from the fact that it absorbs all liquids falling upon it, gives them back in the shape of vapor under the influence of the sun, and is itself constantly decaying. It is stated as a curious fact that this pavement wears out faster on streets where traffic is light than where it is heavy. Cedar blocks are used for paving all through the West, but more freely probably in Chicago than in any other city in the world. They are cheap, and that is a great point in their favor.

GLENRIDGE.

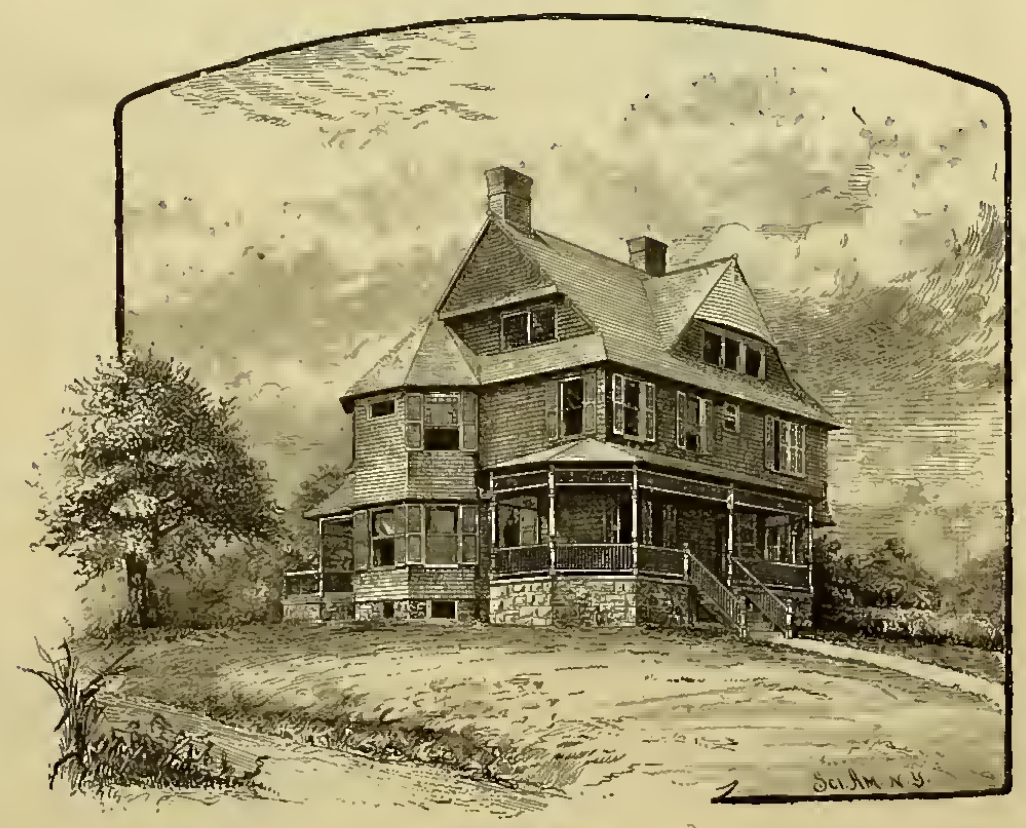
Hemlock.

Respecting the merits of hemlock, the *Minneapolis Lumberman* has a good word in its last issue. It quotes from a correspondent at Williamsport, Pa., regarding the experience with the wood there as a foundation for paving blocks; and in regard to a stretch of Nicholson pavement there which had been down sixteen years, goes on to say:

"The blocks had been placed on two thicknesses of one inch hemlock, the boards coated both sides with coal tar. When the pavement was taken up, the boards were found to be in good condition—so perfectly sound that they were put back again for possbly another sixteen years. The correspondent says that out of a mile of sixty foot street, less than 1⁰,000 feet of the old planking was condemned. There seems to be no question as to the superlative merit of hemlock for paving purposes."

This is valuable testimony, and better evidence of the lasting qualities of hemlock under paving blocks than any Western experience has produced, for the reason that it has nowhere in the West been so long as that in use. It has been recognized, however, as a wood excellently suited to this purpose, and is employed almost exclusively wherever the cedar block pavement is freely used, which includes a good many of the large cities in the United States, and practically all Western towns in which any paving is done. It is apparent that lumbermen are beginning to take a strong interest in hemlock, and evidences of its growth in favor are becoming rather plentiful. It occasionally gets a setback from some local dealer, who has come off second best in an encounter with its slivers, but it is bound to come more and more in use in spite of the strong objection that is made to it by some users. Its light weight and great strength for many building purposes are factors that tell.—*Timberman.*

GLENRIDGE.



GLENRIDGE.

Collapse of Walls of Burning Buildings.

Mr. Alex. Black, writing to the *Building News*, says: The expansion of brick by fire heat may be estimated at rather above half that of wrought iron; and of mortar at about one-fourth more than that of wrought iron. The mortar joints in the wall may occupy, say, one-fifth to one-sixth of the height of the wall. There is no accurate data as to the maximum heat developed at Whiteley's fire. It, however, depends on the nature of the contents, etc., consumed and the accumulation of draught currents. If there is free lime, etc., in brick or mortar, there is added to the expansion more or less disintegration, which would become not the least potent cause of collapse.

We may assume that the interior surface of the brickwork exposed to the fire expanded, say, 1 in. in 8 ft. or 10 ft., vertically and horizontally, which would produce a distortion by buckling, or curving inward, dish-like, of the inside half thickness of the wall, both vertically and horizontally, leaving for a time the outside half thickness (say, for convenience of description) not much disturbed; in the meanwhile, air gets in between these inside and outside half thicknesses, or slices, and it may become gradually expanded by heat and help to force them further apart until the whole wall collapses.

In setting iron girders, the usual practice appears to be to build the ends solidly in the wall to act as a tie; but by having cross flanges at ends the wall may be built close to these on inside toward interior of building, and space left for expansion on their outside; but this space is of no use without the ends of the girders are set upon rollers or rockers, as is done for bridge girders, because the rigidity of wall would not be sufficient to withstand undisturbed the expansive pushing out, or horizontal thrust, of loaded girder end if resting upon a rough bearing plate or block.

If building timber joists into walls, it is a safe method to bevel off the upper corner equal to the bearing of the end in the wall, which allows the projecting portion of joist, if broken accidentally, to drop down without disturbing the wall, by the leverage which it would exert if built in the wall in the usual way.

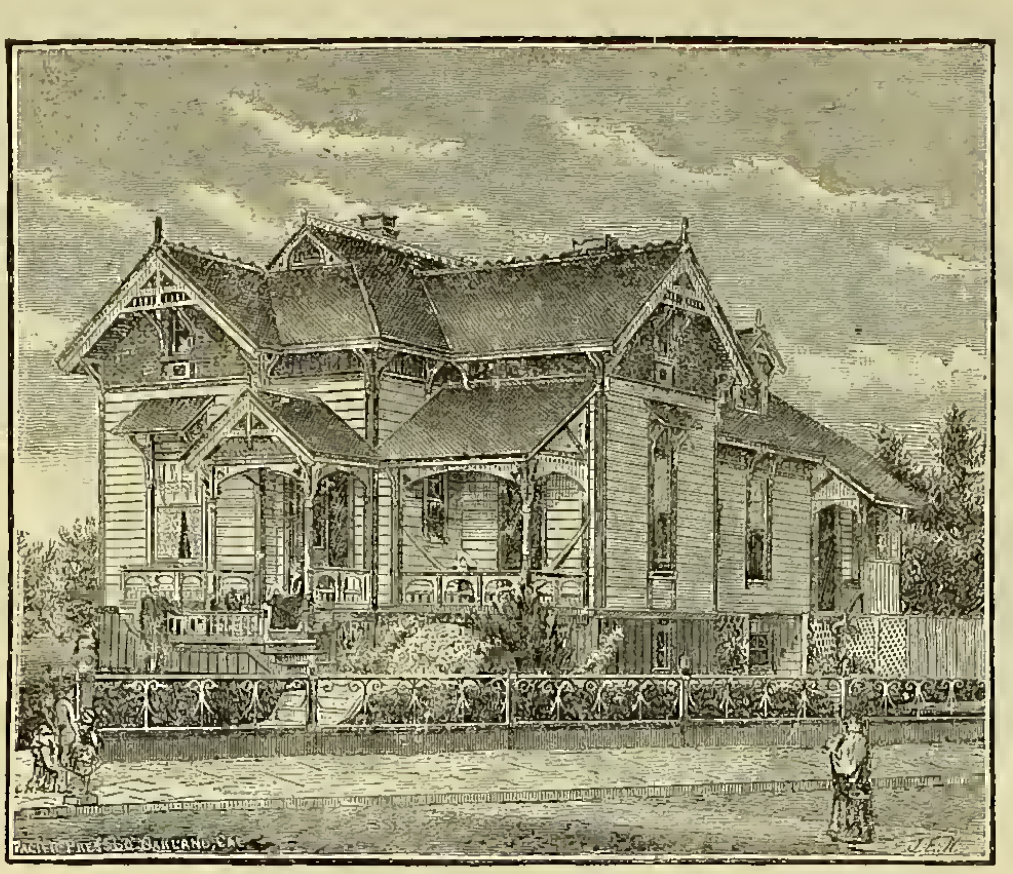
A $2,500 CALIFORNIA HOUSE.

California can justly boast of a larger number of pretty places and picturesque localities in which to erect residences of moderate cost than can be found in any other State in the Union. The beautiful town of Alameda, covering, as it does, a large extent of ground, embracing several square miles, may be regarded as a paradise for those who wish a quiet retreat, away from the din and confusion of the city, and yet be in close connection with the great mart. Nearly every portion of the town is covered with a natural growth of oak trees. Nor does this growth stop at this point. For a long distance to the north the ground is covered by the beautiful trees from which the neighboring city of Oakland derives its name.

Extremes meet in architecture as well as other matters. Some æsthetic persons have sought to copy the humble abode of the laborer in the external view of a dwelling, while the internal arrangements and fittings rival those of Aladdin's palace. Others seek to have the outside present to the eye a conglomeration of whimsical ideas, while they have not deigned to cover the floors with a carpet, nor have a door between any of the rooms or halls, excepting those connecting with the outer world.

Much benefit has been derived from these whimsical erections, and it is only by much study and close application to the fancies of their clients that architects have been enabled to prepare the beautiful bijou plans, a good representation of which is given in this issue. In justice to the architectural profession, we must say that no portion of their practice has been so usefully bestowed as that which has been bestowed upon the production of plans for such homes, a full plan of which accompanies this article.

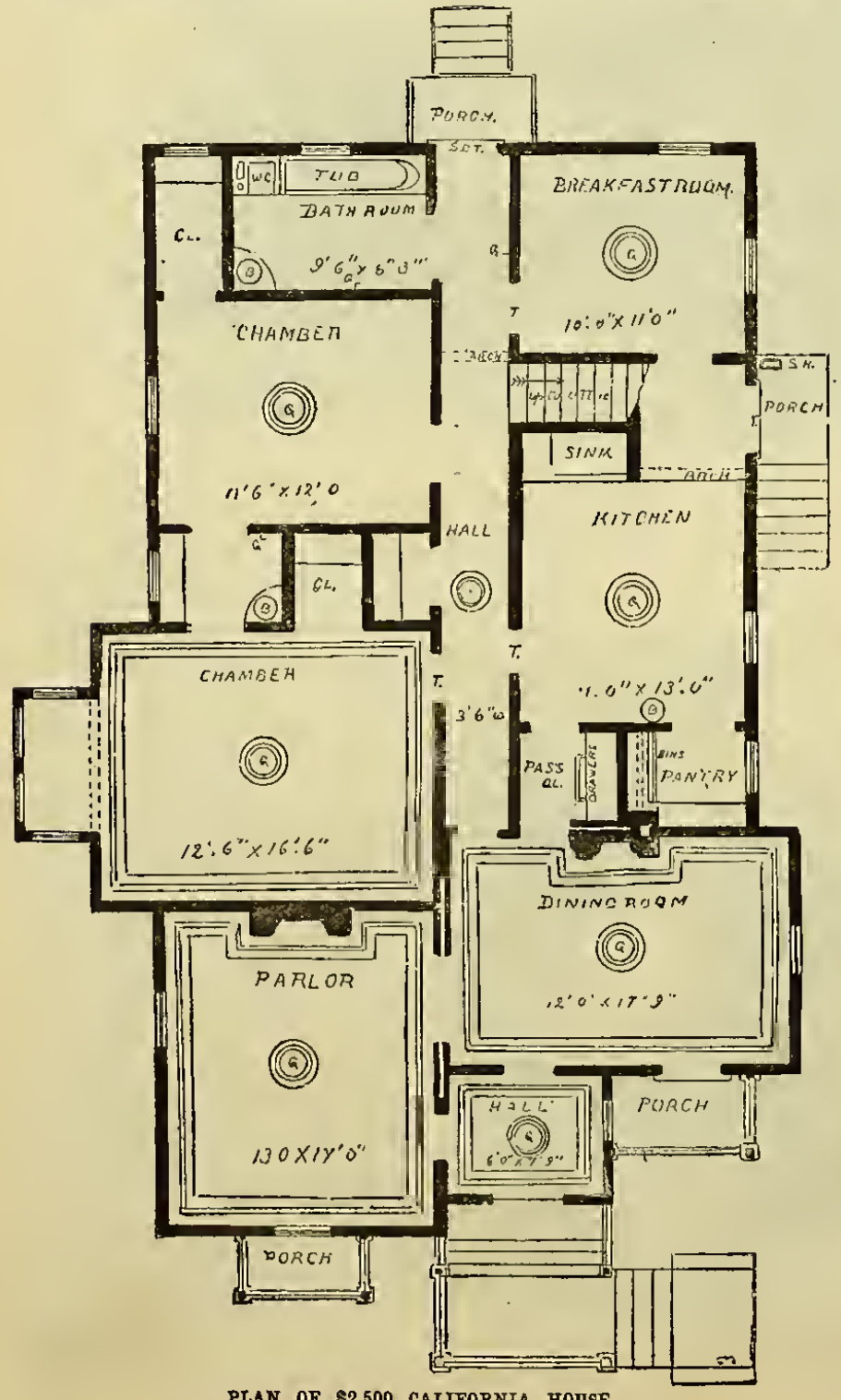
The elevation, as shown, is a model of neatness and economy. At once attractive in appearance and substantial in all its surroundings, it does away with all those horrible idiosyncrasies and bugbears of the Elizabethan and Queen Anne styles. There are no small windows to cause the one who cleans them to utter a whole vocabulary of cuss words at the architect who made so many corners to dig out. There is no part of California but what needs all the sunshine that was intended to enter a room, and the large windows shown allow the heat and light to make glad the hearts of the dwellers therein. Even with the thermometer at 100 degrees and over in the shade at noontime, still, when evening comes, the cool winds that invariably bless the sleep of those who are tired from their daily toil has easy ingress from these same large windows. And in winter, from the absence of snow in all of our beautiful valleys, the same windows are a source of joy and comfort for the occupants to observe the driving rains, or admit the blessed sunshine as it pierces through the wintry clouds.



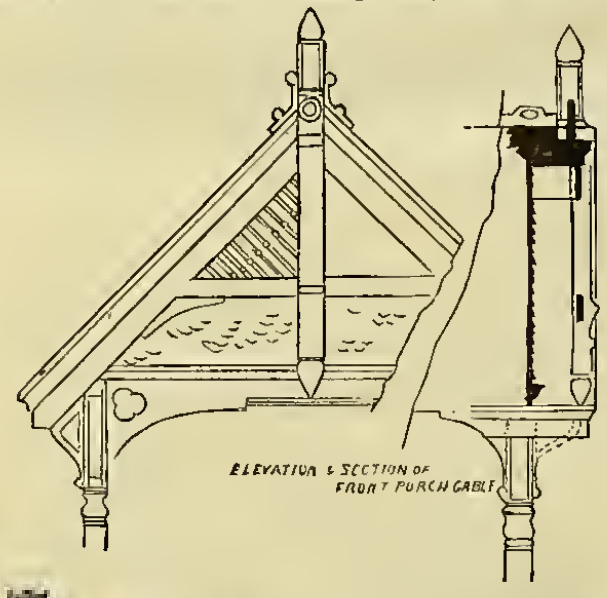
A CALIFORNIA HOUSE FOR $2,500.

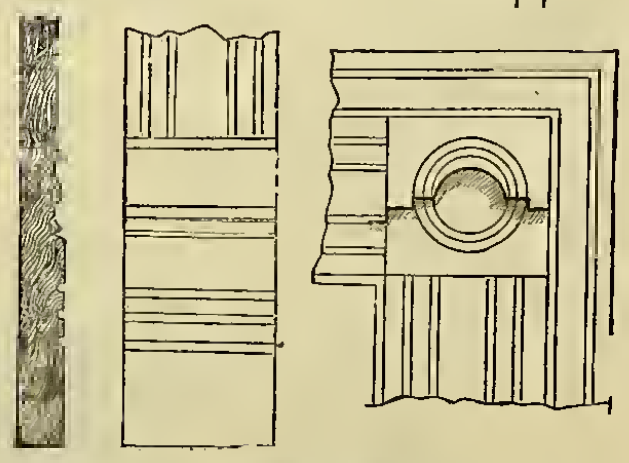
Great care should be exercised in painting the exterior. The colors selected should be a happy blending of light and dark shades. They should be graded from rich, heavy grades at the bottom to the lighter tones at the gable peaks, preserving, through the intermediate section, a consistent harmony. The roof may be of dark slate color. The trimmings may be colored with a combination of blue, black, and Indian red. The body of the house may be varied to suit the above. It must be distinctly borne in mind that all buildings of the same class cannot be treated alike. Trees have a wonderful effect on colors used, and the main study of the painter and owner should be that the salient points of form and detail be enhanced by the proper selection of the various colors. By all means, if you are building a home for yourself, take the good wife into your confidence, and let her judgment be given on the various colors to be used.

The arrangement of the rooms, as shown by the plan, is very desirable for any one with a small family. A feature is made of the entrance way. From the hall, one can pass either to the parlor or dining room, the latter being the general sitting room. The parlor is large—13×17 feet in size. It has a fireplace, as shown. A cornice is also designated. Sliding doors connect this room with the dining room, the size of the lat-

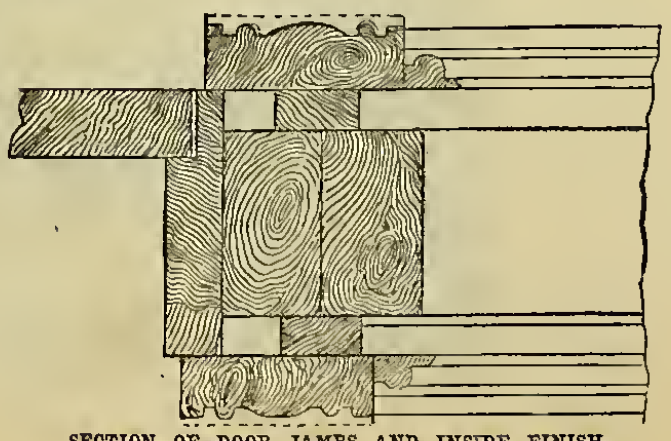


PLAN OF $2,500 CALIFORNIA HOUSE.





INSIDE FINISH.



SECTION OF DOOR JAMBS AND INSIDE FINISH.

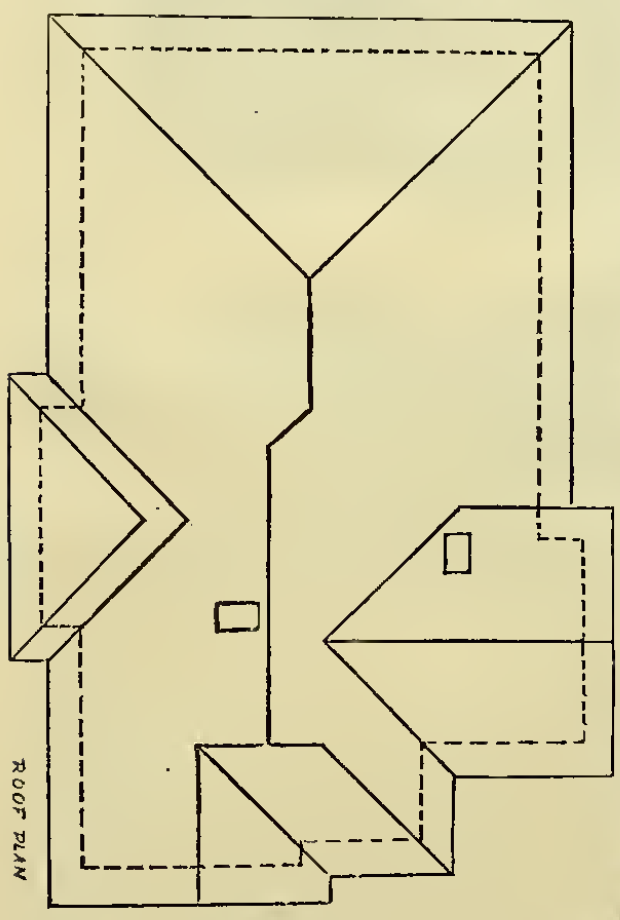
ter being 12×17¾ feet. A cornice and fireplace are also shown. In case of company or family gathering, the two rooms will be practically one. The porch shown in front will be very handy for the gentlemen who smoke, or, on warm days the ladies can use the same for sewing purposes, sheltered, as the plans show, by the roof overhead.

You pass from this room into a hall, from which you can enter all the rest of the rooms. The main chamber is 12 feet 6 inches by 16 feet 6 inches, besides a large bay window, having four windows for light and air. There is also a cornice in this room, and a place for a stove to connect with parlor chimney. There is a very large closet, and also wash room, which is well lighted and ventilated Passing along the hall, we next come to a large linen closet. This will be found very serviceable for the storage of the linen in daily use. Then comes a large chamber, 11 feet 6 inches by 12 feet. No cornice is shown. Should a fire be needed in this room, a patent flue could be placed therein, starting from near the ceiling. A large closet is also connected with this room. At the end of the hall is the bath room, 6 feet 3 inches by 9 feet 6 inches. A wash bowl and water closet are shown. The window, being directly over the tub, assures perfect ventilation.

On opposite side of hall from bath room is a room designated as breakfast room, in size 10×11 feet, with two windows. This can be used as a bed room, should the dining room suffice for the needs of the occupants of the house. This room is very convenient, as it can be reached by three different ways. The next room is the kitchen, in size 10×13 feet, with plenty of light and ample means of ventilation The place for the stove-pipe is indicated by the dotted lines leading to the dining room chimney. Should it be found more desirable to have the stove in a different position from that indicated, a patent flue can be put in, starting near the ceiling. A large pass closet, amply fitted with drawers and shelves, connects with the dining room. There is also a large pantry fitted up with bins, etc.

A stairway is shown, near breakfast room, leading to the attic. No plan is given of the latter, as the space can be divided according to the individual tastes of the parties building. The rear hall is 3 feet 6 inches wide.

The whole plan is very compact, and will bear careful study. The detail drawings, as shown, will give an adequate idea of the various finishes. Each one is distinctly marked.



ROOF PLAN.

We append a general set of specifications to aid those who may see fit to adopt the design. Should any one want a complete set, we can forward them a printed copy.

SPECIFICATIONS.

Excavations.—All rock, dirt, etc., to be cleared away from site of the building. Trenches for walls and piers to be extended down to firm and solid ground. The bank to be dug well away from the walls, and the same to be left open until the walls are well set and dry.

Drains.—To be of ironstone pipe, with cemented joints. The fall to be not less than one-fourth inch to one foot. No drains to be less than sixteen inches from surface of ground.

Brick Work.—Hard, well burned brick to be used throughout. All brick walls to be made level and straight to the proper and exact height, and to a true line from one end to the other, even to the splitting of a brick where necessary. Piers 12×12 inches. Turn trimmer arches for the support of all hearths at the time chimneys are built. All sills to be set in mortar after walls are proper height.

Size of Timbers, etc.—Main sills, 6×8 inches; plates, 2×4; studs, 2×4; underpinning, 4×6; joists, 2×10; ceiling joists 2×4; rafters, 2×4; bridging, 2×3 and 2×4. Studs and joists spaced 16 inches from center; rafters, 2 feet 8 inches from center; underpinning 2 feet 8 inches from center. All timber below main sills to be of redwood.

Roof to be sheathed with 1×6 Oregon pine, well nailed to every rafter. Gutters arranged so as to carry off water wherever directed.

Rustic.—All laps and butt joints to be painted before being nailed in position. Butt joints to have a 3×11 inch piece of tin to keep out water.

Outside Steps to be built upon strong stringers, inch risers of redwood, and two inch treads of Oregon pine, with nosing and scotia. The recess to front hall will be floored six inches below main floor, with three inch Oregon pine, put together with white lead.

Floors.—Oregon pine, tongued and grooved, 4 inches wide, to be used throughout the house. One tongue nail and one through nail to be driven in each piece at each nailing.

Grounds to be of ¾ in. Oregon pine at all openings.

No inside finish to be put on until the last coat of plastering is on.

Face casings to be 6 inches wide and 1¼ inches thick, with suitable plinths.

Sash beads to be fastened on with raised bead screws.

All interior work to be hand-smoothed and sand-papered.

All carved or planted-on work to be primed before putting up.

Bases in all rooms to be 10 inches wide, with 2 inch moulding.

Wainscoting.—Rear hall, kitchen, and breakfast room to be wainscoted 3 feet high, and capped with nosing and scotia. Bath room, 6 feet high all around.

Pantry and Pass Closet to be fitted up with shelves and hooks complete, and bins and drawers as shown.

Lathing.—Good sound lath to be used, laid on not less than ⅜ of an inch apart. Joints broken over 8 laths. No lath to be put on vertically, to finish out to corners or angles; neither must there be any lath run through angles and behind studding from one room to another. All angles to be formed and nailed solid by carpenter before laths are put on.

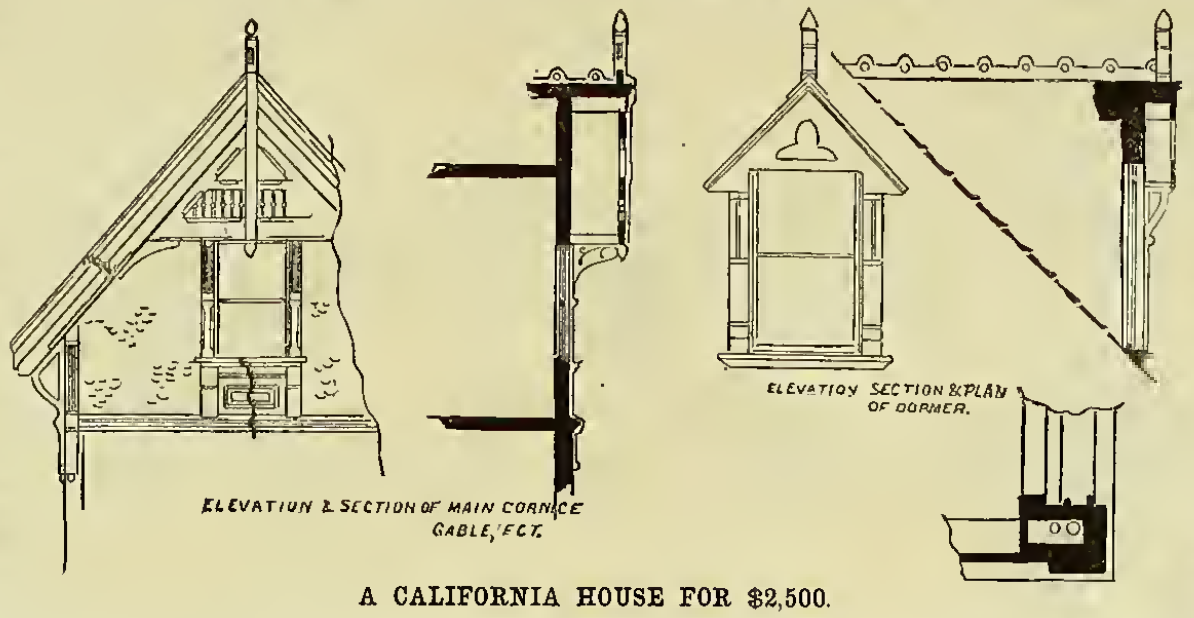
Plastering.—All walls, partitions, and ceilings to be plastered one coat of well haired mortar, made of best lime and clean, sharp sand, free from loam and salt, using best cattle hair. To be made at least eight days before using.

Brown coat to be covered with a good coat of best white hard finish. All plastering to extend to the floor. Center pieces where designated on plans.

Painting.—All interior wood work to have three coats of best white lead, in such tints as may be approved by the owner. Kitchen floor to be oiled two coats.

Gas Pipes to be introduced so as to give the number of lights shown on plan.

Plumbing.—Water pipes to be of galvanized iron ¾ inch diameter. No ½ inch pipe to be used. A 40 gallon galvanized iron boiler, with necessary connections, to be placed in the kitchen. Sink to be of size shown by drawing, to have 2 inch iron water pipe and a Garland trap; 3½ inch brass strainer; back of sink to be lined with zinc. Slop hoppers to be placed as shown. Wash basins to be located as per plan, and to have all necessary hot and cold water connections. Water from all basins to discharge into an open slop hopper outside. Bath tub to be lined with No. 12 zinc, to have a 1¼ inch waste, with Garland trap. All necessary fixtures for bath tub to be placed in proper position. The water closet to be Budde's patent. Place safe trays under all sinks, bath tub, wash basins, water closets, etc., with 2 inch turned-up edges, well nailed to wood work. Three fourths inch wastes. All waste or soil pipes to be connected with the sewer, and extend the same above basins, sinks, bath tub, water closets, etc., out through the roof.



A CALIFORNIA HOUSE FOR $2,500.

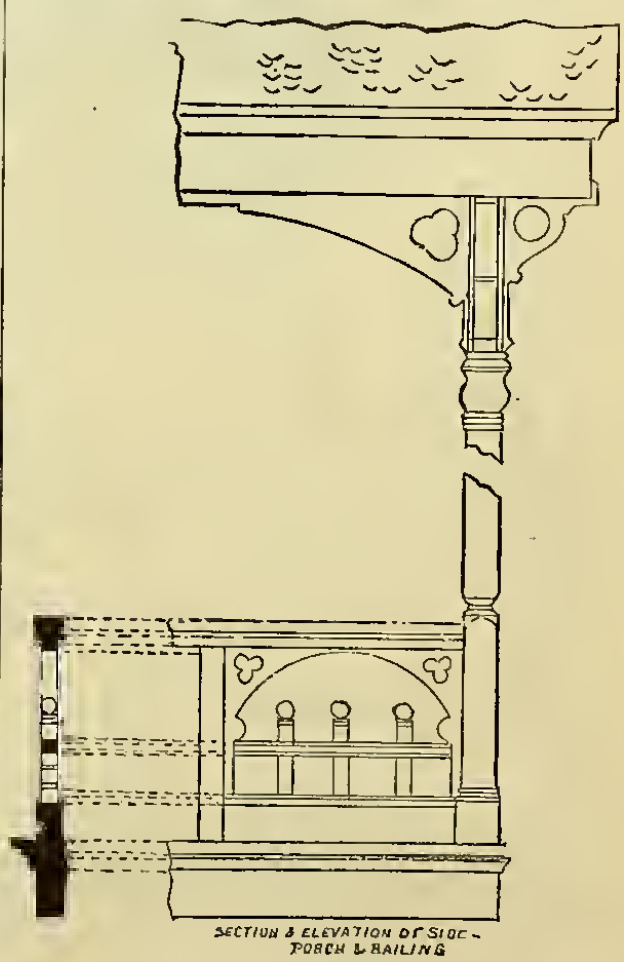
Generally.—Drawings and specifications are intended to correspond, and to be illustrative the one of the other. All drawings to be furnished by the architect. Details to be given from time to time as the work progresses. Should the necessity arise that any change or changes be made from the original design, the owner shall have the right so to do without invalidating the contract, adding to or deducting from the contract price the agreed sum of any change made.

COST.

The above specifications are given as a general index of the work. No accurate estimate can be given from them of the cost of the house. Quality and price of hardware, etc., have been omitted, leaving same to the pocket books of intending builders. As shown, with finishes indicated by the details given, the house can be erected at a cost of about $2,500. Of course this figure can be changed considerably. Using the best of materials, etc., the price should be given at $3,000, at which sum a truly cozy home can be obtained by those seeking a permanent dwelling place.—*California Architect.*

The Architectural Era.

This is the title of a new monthly published at Syracuse, N. Y. It is finely printed, handsomely illustrated, and full of interesting reading matter. It forms a valuable addition to the architectural literature of the day. The elegant style in which it is produced does honor



to its enterprising publishers, Messrs. D. Mason & Co. Three dollars a year, twenty-five cents per number.

Blue Marking Ink for Boxes, Bales, etc.

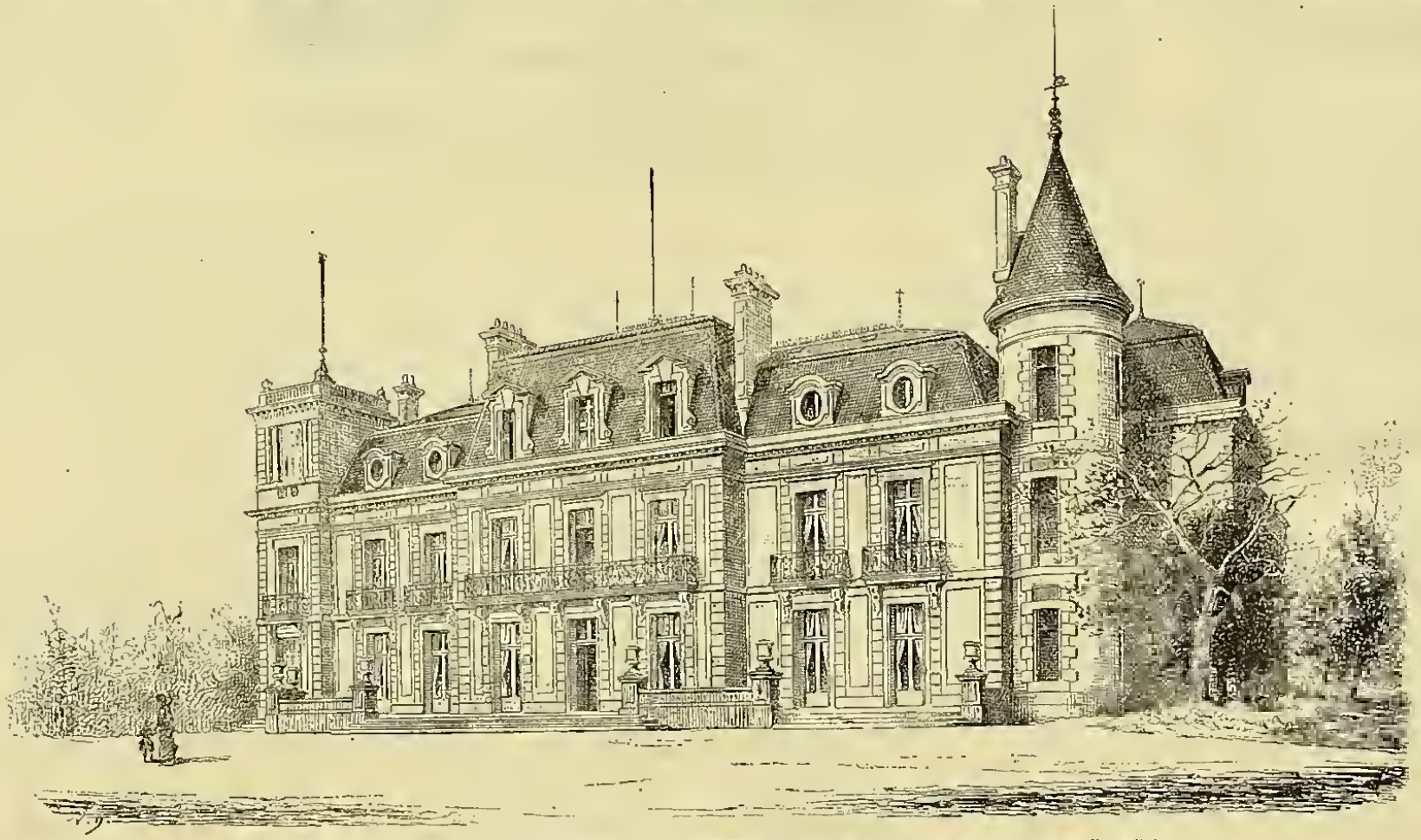
Mix a sufficient quantity of ultramarine with barytes (sulphate of barium, blanc fix) and water to produce the desired tint. It may be rendered more permanent by adding some liquid glue (solution of glue in acetic acid) or some starch paste, prepared with the addition of a little wax.—*Chem. and Drug.*

CHATEAU AT CASTELNAUDARY.

The internal decoration of the structure represented in the accompanying engravings is due to Mr. Arnaud, an architect at Carcassonne. The front already existed in part, and merely the finishing of it is due to him. As for the parlor and dining room, of which we give an illustration, these two rooms, like the rest, were studied with very artistic care by Mr. Arnaud, and the execution of the work was closely watched.

The chimney that decorates the dining room is of Echaillon stone, and was made at the works of Mr. G. Biron. It is 14 feet in height, and cost, all carved, $1,400. The flooring of the rooms is of oak, of two colors, and was put down by the house of Idrac, of Toulouse, which makes a specialty of old oak inlaid floors. The color of the old oak, introduced into the very substance of the wood, lasts an indefinite length of time. The wainscoting of the dining room and that of the parlor is of walnut, and forms a frame, in the case of the dining room, for old tapestry. In the parlor the panels are covered with large-figured cretonne.

The ceilings are of plaster, with mouldings. To that of the dining room are affixed, by invisible hooks, some old Japanese plates. These produce a very happy effect in the ceiling as a whole, and in nowise injure it. The ceilings are painted in softening tints, the principal of which are red, blue and maroon. The dining room cost, as a whole, $3,600, the old tapestry included.



CHATEAU OF CASTELNAUDARY—FRONT VIEW—M. AUBRY, ARCHITECT.

It is 24×30 feet, and the parlor is 28×37 feet.—*La Construction Moderne.*

Nails.

A test has recently been made of the relative value of wire and cut nails, with results quite at variance with generally received opinions. This test, given below, is published in a circular issued to the nail trade by the Wheeling nail manufacturers, and was made by a committee appointed by the Wheeling manufacturers, who give the following result:

	Number of nails in pound.		Pounds required to pull nails out.	
	Cut.	Wire.	Cut.	Wire.
20d	23	35	1,593	703
10d	60	86	908	315
8d	90	126	597	227
6d	160	206	383	200
4d	289	316	286	123

This test showed the relative value of a pound of each kind to be as follows:

1 lb. of 20d. cut nails equals 1·40 lb. of wire nails.
1 lb. of 10d. cut nails equals 2·01 lb. of wire nails.
1 lb. of 8d. cut nails equals 1·87 lb. of wire nails.
1 lb. of 6d. cut nails equals 1·49 lb. of wire nails.
1 lb. of 4d. cut nails equals 2·06 lb. of wire nails.

In obtaining the above results, two tests were made of the 8d. cut nail and four of the 8d. wire nail; three tests each were made of the 6d. and 4d. cut nails and 6d and 4d. wire nails, and the average is shown.

The committee report as a result of their experiments that $1 worth of cut nails will give the same service as $1.78 in wire nails, if at the same price per pound.—*Building.*

Rabbit Remedy.

A correspondent of the *Revue Horticole* states that he has been completely successful in saving both his vines and haricot beans from being totally destroyed by the rabbits which swarm in this district by using a remedy which he terms the "Bouillie bordelaise." This consists of a mixture of sulphate of copper (bluestone or blue vitriol) and fresh slaked lime, in the proportion of 3¼ lb. of the former to 4½ lb. of quicklime in twenty-one gallons of water. The bluestone is first dissolved in a bucket of water, the quicklime is then slaked, and when cool it is thrown along with the dissolved bluestone into a barrel or other vessel of sufficient size; water is then added to make up twenty-one gallons, and the whole is well stirred up. The mixture is conveniently applied with a whitewash brush, and in fine, dry weather only should it be used. The object of the lime in the mixture is to counteract any ill effects that the sulphate of copper or bluestone might have on the vegetable tissues, and also to indicate that no part of the stem or plant which it is intended to protect has been passed over without receiving its proper share of the application.

How to Build an Ice House.

Under this head the *American Architect* advises a correspondent as follows:

1. The ice house floor should be above the level of the ground, or, at least, should be sufficiently above some neighboring area to give an outfall for a drain, put in in such a way as to keep the floor clear of standing water.

2. The walls should be hollow. A four inch lining wall, tied to the outer wall with hoop iron, and with a three inch air space, would answer, but it would be better, if the air space is thoroughly drained, to fill it with mineral wool, or some similar substance, to prevent the movement of the air entangled in the fibers, and thus check the transference by convection of heat from the outside to the lining wall.

3. A roof of thick plank will keep out heat far better than one of thin boards with an air space under it.

4. Shingles will be much better for roofing than slate.

5. It is best to ventilate the upper portion of the building. If no ventilation is provided, the confined air under the roof becomes intensely heated in summer, and outlets should be provided at the highest part, with inlets at convenient points, to keep the temperature of the air over the ice at least down to that of the exterior atmosphere.

In reply to inquiries from various correspondents we would say that Messrs. Munn & Co., 361 Broadway, proprietors of this periodical, have an extensive architectural bureau connected with their establishments, and here, with the assistance of an able corps of architects, they prepare, in the best and most prompt manner, designs, plans, specifications, and details for all kinds of buildings, churches, schools, stores, dwellings, etc. Hundreds of buildings in all parts of the country have been erected from their plans. Messrs. Munn & Co. will be pleased to furnish any information desired by readers relative to any buildings illustrated in these pages.

Look to Your Drain Pipes and Wells.

The Rhode Island State board of health has completed its investigation of the epidemic of typhoid fever at Conanicut park hotel, made last summer.

At the opening of the season of 1887 trouble was experienced, but no action was taken. Soon the people in the house began to be ill, and at a time when all the rooms were taken and many more guests were to come and occupy the cottage apartments. From the first symptoms, which were not considered serious, the disease, which proved to be typhoid fever, assumed a violent form, and Dr. Jernigan, on whose advice several patients had come to the island, directed a practical plumber to make a thorough examination of the premises.

The plumber discovered that the pipes leading from the water closets had leaked into the cellar, and that from all appearances the leak had existed from the first of the season. The sewage had run into the well from which the water was drawn for general uses about the hotel. Prior to the discovery of the contamination of the water, its sparkling qualities had been praised by all the guests. The plumber also reported that the ground near the well was saturated with the sewage, and that when disturbed the earth emitted an overpowering and sickening stench. From the cellar the investigation was continued to the well at the north end of the house. It was dug quite recently, and the shaft had been sunk through an old drain leading to a cesspool, and a portion of the drain constituted a section of the well shaft.

The State board of health proposes to ask for an appropriation this winter sufficient to pay for a careful examination of all the hotels in the State, and the inspection and analysis of all waters used for drinking purposes where there is liability of contamination.—*Sanitary News.*

Messrs. Munn & Co., in connection with the publication of the **Scientific American,** continue to examine improvements, and to act as Solicitors of Patents for Inventors.

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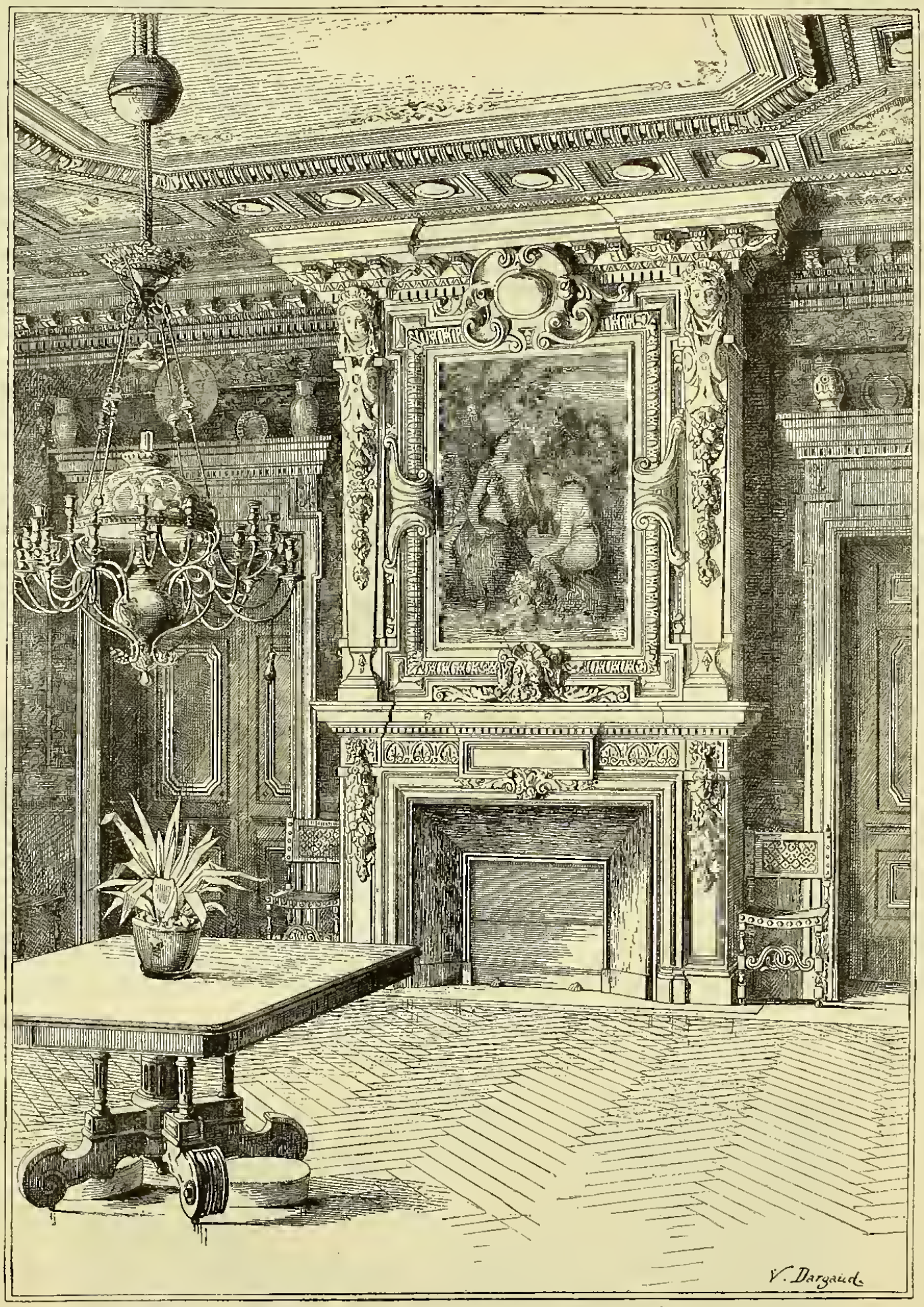
Arch Construction.

Iron construction has so completely superseded masonry for bridge building that it would appear almost unnecessary to discuss the question of the equilibrated arch for any large span. But the mathematical principles of the arch have always been an interesting subject with geometricians and theorists, and the theory, at any rate, ought to form one of the subjects of the architect's and engineer's education. As a problem of the equilibrium of forces, the theory of arch construction is instructive, inasmuch as it presents us with a concrete example of three forces balanced in a structure.

The other day, at the opening of the engineering section of the Bristol Naturalists' Society, at University College, Bristol, the president, Mr. Charles Richardson, C.E., read a paper on arch building, in which he advocated the employment of arches of equilibrium for bridges. The author referred to the well known and elegant property of the balanced arch, which is derived from the principle of the catenary or suspended chain or inverted polygon of bars, each bar or link assuming the position (inverted) that the arch stones of an equilibrated arch would have. In Dr. Hutton's valuable "Tracts on Bridges," this principle is followed in his elucidation of the arch, and readers of that work will remember the diagrams given of various kinds of balanced arches, and the curves of extrados necessary to insure equilibrium. The theory, indeed, is older than Hutton. Belidor and Dr. Hooke both investigated the form of the extrados from the nature of the curve, and this theory has been made the foundation of a very interesting system of designing arches. According to this theory of the question, the stones are considered free from all friction—a condition which does not hold in practice. Mr. Richardson follows, as far as we can see, this theory. He enunciated the theorem that the weight on any point of the arch is proportional to the vertical line from the road line to the intrados at that point; that the horizontal thrust is the same throughout the arch, and is equal to the weight on the crown per unit of area multiplied by the radius of curvature there; and also that the bed pressure at any point is equal to the horizontal thrust multiplied by the secant of the angle the curve makes with the horizon at that point. This rule is thoroughly mathematical and true for arches of equilibrium; and the author exhibited an instructive model of an arch equilibrated, and showed by inverting it, and suspending a chain weighted by steel rods representing the loads at each point, that the latter coincided with the road line. But the engineer-architect has to do with arches in which the element of friction enters; the stones are cemented, and therefore the theory, however beautiful, does not hold good in every case. Instead of the separate arch stones or voussoirs, he has to deal with segments of the arch which turn upon certain edges. Thus an arch which fails breaks into four parts, the crown sinks, and the haunches rise, the joints at those points opening. One of the questions to decide is the points at which rupture occurs, that being found to find out what horizontal pressure each of those lower segments have to sustain. From knowing the thrust and its point of action, the stability of the arch will depend on the mass and weight of the pier. The experiments of Rondelet and others have proved that the voussoirs unite into segments of the arch, and tend to overturn the abutment, acting rather as levers than wedges. He found, also, that the greatest thrust was in arches with an even number of voussoirs or a point at the vertex; that a keystone lessened the thrust. Nevertheless, the theory of equilibration should be known by all architects and bridge builders.

In alluding to the materials, the author showed the impossibility of dressing and bedding stones accurately. Practically, the stone built arch is difficult to execute with precision. The facing stones only are cut to the true curve, the backing being filled in with rubble and roughly executed. With brickwork the bricks can be all bedded in cement, being more convenient for handling, and a vitrified brick is equal at least to the best stone in resistance. The brick arch should be built in vertical bond, not in rings. Mr. Richardson finds that, taking the safe load in cement at 5 cwt. upon the square inch, an arch 15 in. thick at the springing and 12⅝ at the crown is sufficient for a span of 85 feet with a rise of ⅛ of the span. He says: "As all loads and thrusts on such an arch are in direct proportion, if each dimension were multiplied by four, we should have a span of 340 feet with a rise of 42 feet and an arch thickness of 5 feet. This 5 feet thickness would give a sufficient margin of safety for the moving load, because 5 feet is only the necessary thickness at the springing, while that at the crown would be 9 in. less. The total weight of this bridge would be 100,000 tons." Ring-built arches are advisedly objected to, as the rings tend to separate when any settlement takes place. Mr. Richardson does not rely too much on friction, and he is right. There can be no scientific arch construction that is not based on the principle of equilibrium, the line of thrust being kept within the middle third of the arch thickness; and in designing arches of brick or stone the engineer should always be able by diagram to satisfy himself of this condition. Whenever the line of thrust passes close to the lower edge of the arch ring at the haunches, there must be undue pressure and a tendency to open at the other edge. In other words, the arch is inclined to drop at the crown. When it passes out of the arch, failure must take place sooner or later. Instead of first deciding upon the curve and road line, as is frequently done, the right course is to find the line of thrust for the given span and loading, and then make the arch conform as nearly as possible to this line. We agree with the opinion that brickwork, if correctly applied, would be found to excel iron construction in strength, durability, and economy—certainly in appearance. In the construction of masonry arches, sufficient care is not always bestowed upon the drainage of the arches—a cause, we imagine, of many failures.—*Building News.*



INTERIOR OF CASTELNAUDARY CHATEAU.

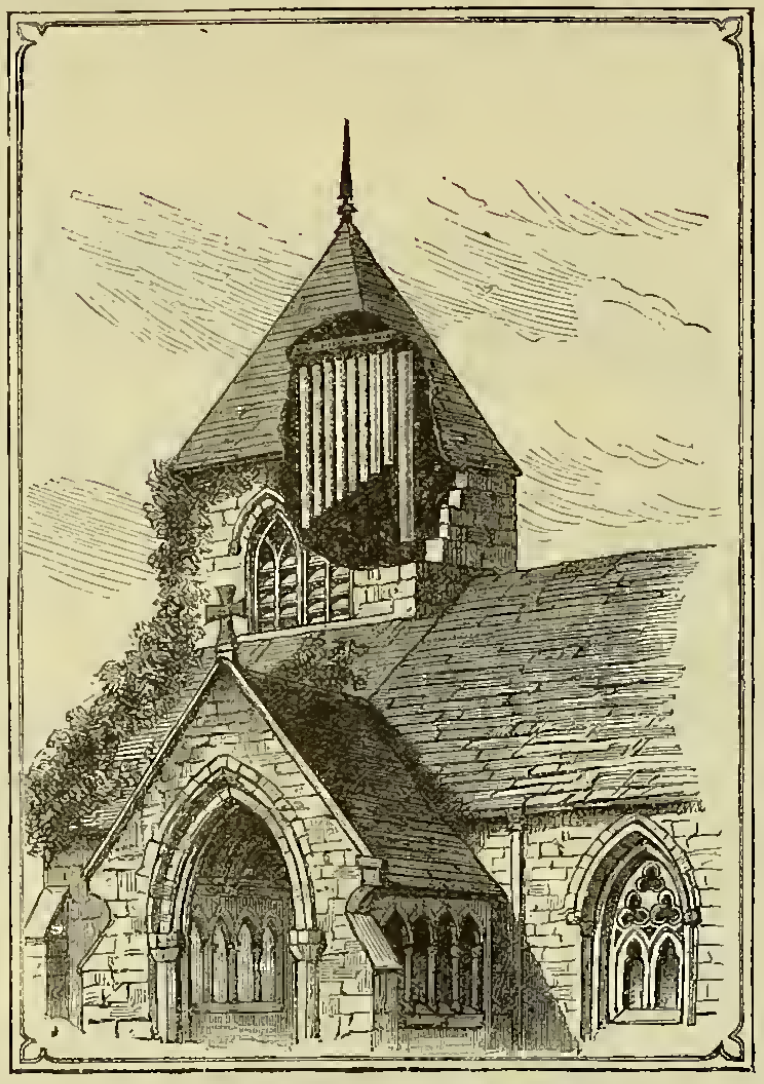
GILBERT SHEFFIELD, a Warren County, N. Y., lumberman, is one of the men who believes in using his men well, and in doing something to relieve the tedium of life in the woods. He has 35 men employed at Tahawus, in Essex County, and says that for the past two years it has been his practice to furnish them with copies of the prominent newspapers, so that when they left camp they were as well informed regarding current events as when they went in.

NEW FORM OF CHIMES FOR CHURCHES.

A new form of chimes for churches is being introduced in England, which are said to give much satisfaction. They consist of a series of metallic tubes suspended from a beam, as shown in our engraving. They are struck by hammers, are very resonant, loud, and pleasing. A correspondent of the *Pall Mall Gazette*, speaking of their effect, says: "The music of many tuneful bells, harmonious, ever changing, lending themselves to any simple air, easy of management, and mellowed as the sound of cathedral bells. . . . Such music I have heard at Coventry."

Tube Chimes.

The new invention which goes under the name of tube chimes is a musical chime in which metal tubes instead of bells are employed. The tube chimes can be used for any purpose that bells are used for, and besides are an economical substitute for bells. They are remarkable also for a depth and richness of tone which one does not expect to find except in high class cathedral bells. A tube chime for a church belfry is especially suitable. The carrying power is not quite equal to that of bells. A chime was lately set up in the tower of one of the Dorsetshire churches which has pleased all concerned. Rung for the first time on occasion of the harvest festival, it caused both delight and surprise by the sweet and melodious tones it gave out. The invention has not long been brought under public notice, but the demand for household octaves in place of the inharmonious gong is already very large. Mr. Harrington has a taste for music, and the idea of adapting tubes of metal for the musical purposes of bells is no new one. It has taken, though, many years of experiment and study to perfect the principle. One difficulty, which was a great obstacle in the way, may be alluded to. The large chimes are rung by bell ropes, but, contrary to the plan of bells, there is an external hammer instead of the internal clapper. If the hammers were made of sufficient hardness to prevent wear and tear, the chime lost its sweet tones and became harsh. If the hammers were less hard, they would constantly require to be replaced. Fortunately, that difficulty, like many others, has been satisfactorily got over. The chimes can be, it should be noted, tuned to any desired pitch, and Messrs. Harrington & Co. are probably warranted when they say: "The introduction of this invention will, we are assured, mark the commencement of a new era in connection with church bells and carillons, chimes for clocks of all sizes, dinner calls and gongs, and all mechanisms in which musical bells are used or required, and in some of these departments bids fair to work a complete revolution."—*The Architect.*

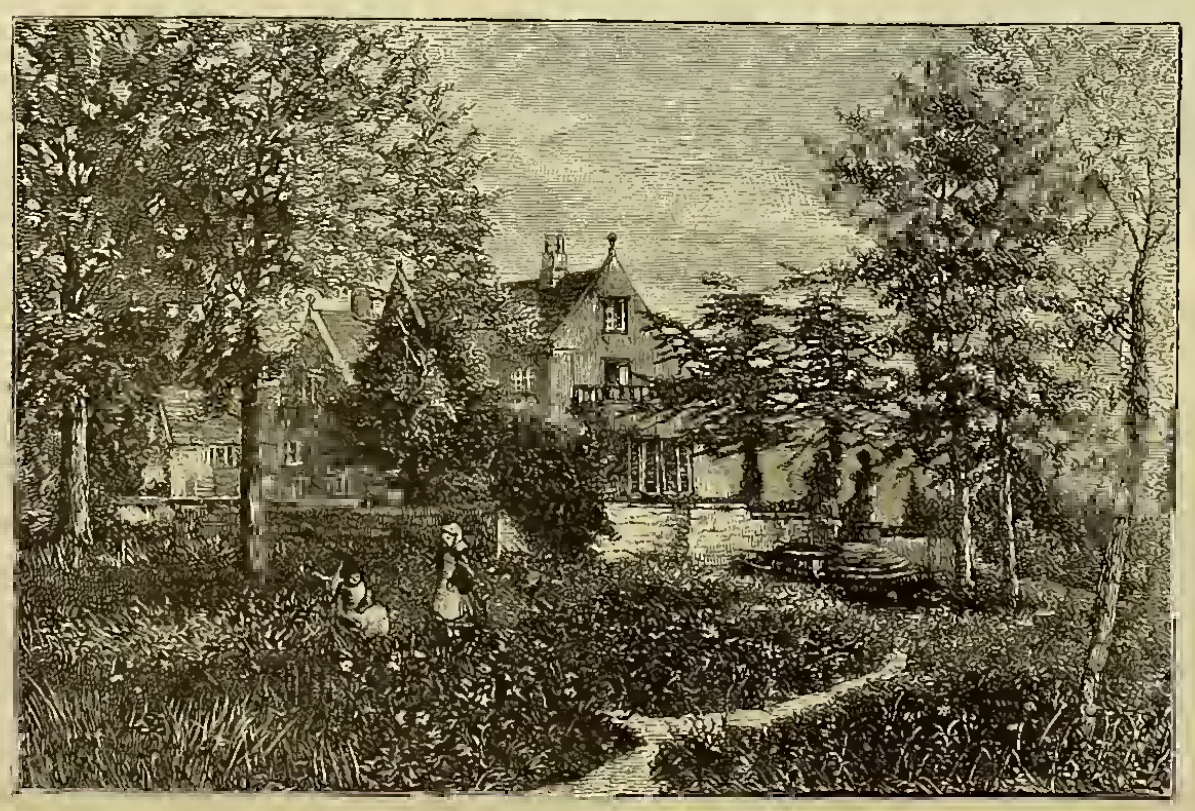


THE NEW TUBE CHIMES.

MISS FLORENCE NIGHTINGALE'S HOME.

At the residence of Sir Harry Verney, Claydon House, Buckinghamshire, a deputation from the Working Men's Club of Whatstandwell, Derbyshire, recently waited on Miss Florence Nightingale, for the purpose of presenting to her an oil painting, by Mr. E. Crosland, of her late home, Lea Hurst, as a token of their esteem, and in recognition of the great interest taken by her in that institution. The deputation, consisting of Mr. F. C. Iveson, Mr. Crosland, the artist, and Mr. W. Peacock, assured Miss Nightingale of the love felt for her by all classes of people at Whatstandwell and in that district, and of their gratitude for her kindness and help in every good work. Miss Nightingale, in thanking them for the present, which she admired very much, expressed her continued great interest in the institution and its members, and assured them of her hopes for its welfare. The deputation were entertained at Claydon House by Sir Harry and Lady Verney. We are permitted to copy the picture of Lea Hurst in our engraving, using a photograph taken by Mr. J. Schmidt, of Belper.

Miss Florence Nightingale is a lady whose name has been deservedly honored in England since the Crimean war and has become the symbol of a particular type of personal efforts in the service of afflicted humanity. She was born at Florence, in May, 1820, youngest daughter and coheiress of W. E. Nightingale, Esq., of Lea Hurst, Derbyshire, and Embley Park, Hampshire. She devoted her attention to the working of schools for the poor, juvenile reformatories, and hospitals, inspecting many such institutions on the Continent, and residing, in 1851, with the Protestant Sisters of Mercy at Kaiserswerth, on the Rhine. She next bestowed her care and gifts of her money on the London Governesses' Sanatorium in Harley street. During the Crimean war, in 1854, when the inefficient state of our military hospitals in the East demanded instant reform, the hospital at Scutari, opposite Constantinople, was established for the relief of sick and wounded British soldiers and prisoners. It was resolved to form a select band of volunteer lady superintendents and female nurses for this and other army hospitals. At the request of the Secretary of State for the War Department, Mr. Sidney Herbert, afterward Lord Herbert of Lea, Miss Nightingale undertook the task of organizing and directing this service, which she performed in a manner universally admired, and which earned her the personal friendship of the Queen, with many public and private expressions of gratitude and esteem. A testimonial fund amounting to $250,000 was subscribed in recognition of her patriotic and benevolent work, and was, at her special desire, applied to create and maintain an institution for the training of nurses. Miss Nightingale's impaired health, for many years past, has debarred her from active public exertions, but she has continued to study the plans and operations of those charitable agencies on which she is a high authority, and has written brief treatises on subjects of much practical importance. Her "Notes on Hospitals," printed in 1859; "Notes on Nursing," in 1860; and "Notes on Lying-in Institutions," and on the training of midwives and midwifery nurses, in 1871, were of considerable utility. She also wrote, in 1863, valuable observations on the sanitary condition of the army in India, and has furnished to the War Office useful reports and suggestions concerning the army medical department.—*Illustrated London News.*



LEA HURST, DERBYSHIRE, THE HOME OF MISS FLORENCE NIGHTINGALE.

Painting.

In order to use paints and oils economically, a clear understanding of their purpose and action is absolutely necessary. Linseed oil is said to "dry" after being applied. That is only partially true. It rather oxidizes and changes to a tough, gummy substance not unlike hard glue. This action is accelerated by the use of "driers," as they are called. But in no case does it give the same results as when left to dry of its own free will. The carbonate of lead or mineral which is added to the oil gives the color and assists in making up the body. The life of the paint is the oil, and when it is oxidized, it alone is the binding element. Upon it depends the durability of the paint. A piece of wood dipped in linseed oil and hung up to dry, or oxidize, in the air, will soon become covered with a beautiful translucent film of oxidized oil, which grows harder daily. It will take a high polish and preserve the wood. Another piece dipped in carbonate of lead, or mineral, mixed in turpentine, or any fluid to allow it to spread evenly over the surface, will when dry have a dead or flat color without polish or body to bind it together, and the slightest abrasion will remove portions of it. All painting is done either with pure oils or with the admixture of a fluid like turpentine, which assists in the distribution of the mineral, but does not add to the body. When the surface of wood has been covered with a thick coating of oxidized oil, it can be washed and rubbed to look clean and polished. Boats, when of a light color, are often painted with a mixture containing much turpentine, in order that all marks may be removed with a little beach sand, by rubbing off the mineral, which is not bound together securely by oil, but only loosely by turpentine. Car builders now often paint their cars or varnish them a second time soon after the first, say after about six months' run. This gives them a good coat of oxidized oil to withstand the weather and preserve the wood. A few coats applied within short intervals produce a fine covering which is very durable and will take a polish after washing.—*Master Mechanic.*

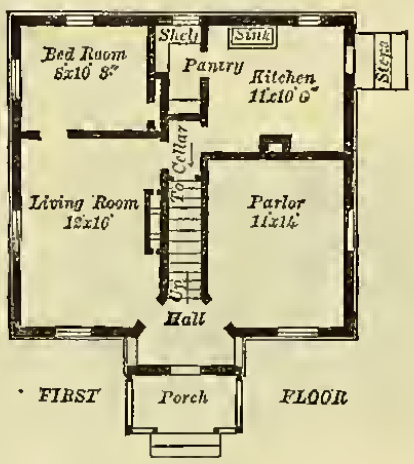
Removal of Chimneys.

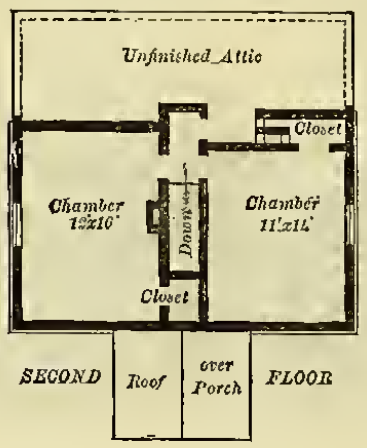
An interesting scene was caused recently by the blowing up of the two immense chimneys on Borsig's machine works in Berlin. A large number of spectators were present to witness the ceremony, including several officers of the army, the trustees of the Borsig estates, and the employes of the works. Punctually at five minutes past six P. M., the signal to "Look out!" was given; then came the word of command, "Fire!" and at this moment the vast chimney, towering to a height of say 120 feet 9 inches, quietly collapsed The noise occasioned by the fall was not very great, ditches two meters in breadth having been dug all round the chimney and filled with straw. For blowing up this colossus, which consisted of 98,000 bricks and was topped with a heavy iron cap weighing twenty-five centners, only 24 kilos of dynamite were employed. Photographs were taken of the chimney before it fell, and also as it was in the act of falling, by an officer of the Commission for Experimenting with Explosives. The second chimney, standing about 80 feet high, was blasted with gun cotton, of which 35 kilos were required.

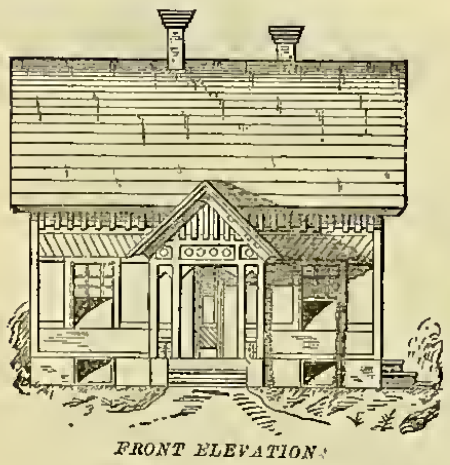
HOMES OF FACTORY OPERATIVES.

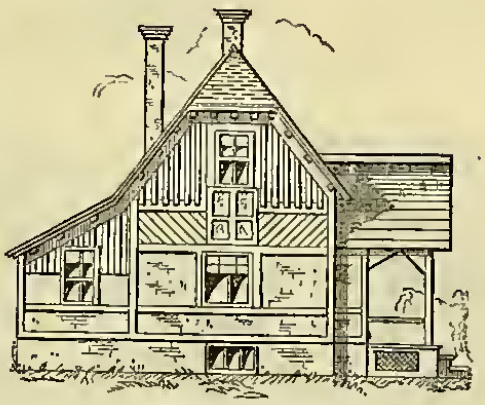
The institution of the factory system changed the workshop home of the domestic system to the home proper by transferring work to the factory. As a result, the homes of the operatives under the factory system have undergone a great change, and are still undergoing changes, which are making the English significance of the word "home" a reality to the poorest. It is perfectly true that in every large factory town one can find loathsome dwellings occupied by groups of persons called families. In most factory towns, both in America and Europe, it is easy to find dwellings occupied by factory operatives which are a disgrace to the owners and the municipality. Yet, taking the operative population of such towns as a class, they are very comfortably housed, and about as well housed in one country as another. The personal inspection of more than 1,000 homes of factory operatives leads Mr. Carroll D. Wright to this conclusion, he having written a special report on the "Factory System of the United States" for the Census Bureau.

British factory houses being floored with stone, as a rule, present a cold and cheerless look. The dimensions of the British house are much smaller than factory houses in America. The tenements of three rooms have much less space than tenements of three rooms here. This is generally true of all European factory towns. But the houses of the operatives are, as a rule, separate ones, the tenement house being quite unknown except where what is termed the "model workingmen's houses" are being tried. The boarding house is not an institution for factory operatives.






FRONT ELEVATION.


SIDE ELEVATION.

OPERATIVE'S HOUSE AT WILLIMANTIC FACTORIES.

At Saltaire, near Bradford, the homes of the workpeople are excellent; rents vary from $30 to $100 per year for three to five room houses. The houses are neat, tidy, and prettily furnished. At Queenshury, where John Foster & Son have works, the weavers earn 15 to 18 shillings per week full run, and the rents are 84 cents per week for three rooms. Some of the best houses in England are at Copley village, in Halifax, built by James Akroyd & Sons. They rent three rooms for £10 per year, and the operatives are helped to acquire a freehold. The Crowleys at Halifax employ 5,000 people, who have good houses. The houses at Salford and Manchester are not so good. The factories at Paisley are excellent evidences of the good influence which arises from proper interest in employes. The works of the Messrs. Clark and Messrs. Coates are model establishments and the influence of model works extends to the houses of the people employed, which are here very comfortable. Rents vary from 72 cents to $2 per week, according to number of rooms.

In Glasgow no cellarages can now be found. The operatives have gone to the suburbs, where they have changed their cramped city abodes for clean and light houses. Belfast, Ireland, is improving the dwellings of the linen factory operatives. The houses are tidy, and rents are from 48 to 60 cents per week for four rooms There are houses with flats in Belfast. In the west and east of Scotland the operatives live very largely in flats; rents in Dundee and Dunfermline being for two rooms from $15 to $30 per year, and for three or four rooms from $30 to $50 per year

Among the most substantial houses for workingmen will be found those of Herr Krupp, in Essen, Rhenish Prussia. By his system of employment he has the selection of the best mechanics in Europe. This system comprehends all the advantages to be found in model industrial establishments, including excellent tenements and gardens at low rents. A foreman, a gunmaker, earning $45 per month, receives four rooms, a drying place on the roof, a cellar, and a garden for $45 per year. A workman with wages at 75 cents per day pays $37 per year for three large rooms, drying place, cellar, and garden. The reare fair tenements, in two or three story blocks, situated in colonies just outside the towns. For $100 per year, one can obtain a most excellent tenement of seven large rooms, cellar, garden, etc. The houses in the colonies are owned by Herr Krupp. In fact, he believes that he receives better results by owning everything, and by being able thereby to control the sanitary surroundings of the dwellings of his people. These colonies, each having its name, are laid out with park, schools, churches, supply stores, etc. The housing of the single men is on the barrack plan.

It may be stated that the houses in Great Britain and on the Continent are of stone or brick, as the locality may afford, and the neat wood cottage of America cannot be found. It is quite impossible to compare the houses of European factory operatives with those of the same class in America. The great mass of the former are, generally speaking, quite as well housed as the latter, so far as the quality of the house is concerned; but so far as quantity of room and excellence of living are concerned, the advantage is with the operatives of America. When the operative of this country steps out of the boarding or the tenement house, he steps into an individual home the equal of which cannot be found in the factory towns of the Old World.

The cottage of the American factory operative, when he sees fit to occupy one, is superior to the cottage of the workingman of any other country. It is most gratifying to know that the individual homes are not only increasing in number in this country, but they are increasing in influence. In all the leading factory towns this is the course of progress.

The plates we give on this page represent one of the styles of modern cottages built by the Willimantic Linen Co., of Willimantic, Conn. With each cottage is quite a garden of several thousand feet of land. The rent is from $60 to $125 per year. These houses are located in such a way as to exhibit variety of styles; that is, two of like architecture are never placed side by side. The company has a large number of these houses occupied by operators and overseers. The cuts show the front and side elevations, and the plans of the two floors. These are given as a type of the detached workingmen's homes used in this country.—*Min. and Sci. Press.*

Gangways v. Staircases.

Mr. A. Lindsay Miller, in the *Building News*, recommends for theaters and other public buildings the use of gangways instead of stairs.

In public works, especially dye works, they will not use the stairs, but gain access to the several floors by gangways, with a rise of about 5 ft. in 12 ft. or 13 ft. of length, and any one watching the speed and ease with which the workers run from floor to floor would at once understand why staircases are not used. Of course, architecturally, they have not the dignity of the staircase; but, in theaters and music halls, dignity is secondary to security. The advantage of the gangway is easily explained.

In going down a stair, each step, or, in a hurry, each second step, must be taken, and the slightest mistake throws the person down. In a stair 12 ft. long, at least six different steps require to be taken. In the gangway of the same length, a person in a hurry, or in the excitement of a panic, would take it in two bounds, and with perfect safety.

ROBURITE—A NEW EXPLOSIVE.

A number of experiments were conducted lately at the works of Messrs. Heenan & Froude, Manchester, with a new explosive, called "roburite," which is manufactured in Germany, and is about to be introduced into this country for use in blasting operations. The composition and process of manufacture of this explosive are kept secret, but we understand that it consists of two non-explosive and perfectly harmless substances, of such a nature that they may be stored or transported without special precautions or restrictions. These two substances may be mixed together when required, and, in combination, become roburite, a yellowish compound, which will bear rough handling with safety. We understand that an intense heat is necessary to explode it. In order to prove this, the explosive was placed, in the experiments in question, between two plates, which were freely rubbed together and hammered; and a small quantity thrown upon a fire was merely consumed, without exploding.

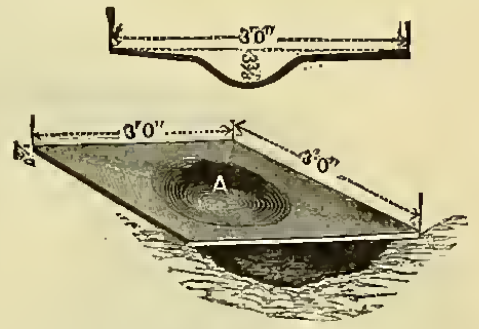


Fig. 1.

In order to obtain an idea of the explosive effectiveness of roburite, eight ounces of the explosive were placed on a plate of the very best steel, at the point marked A in Fig. 1, which shows the state of the plate after the explosion. This plate was 3 ft. square by ½ in. thick, and a bulge of about 1 ft. diam. and 3½ in. deep was caused by the explosion. Twelve ounces of the explosive were then placed at A (Fig. 2) on a cast iron plate, 6 in. thick, and weighing nearly three tons. After the explosion the plate was found to be broken transversely, in the manner shown in the engraving.

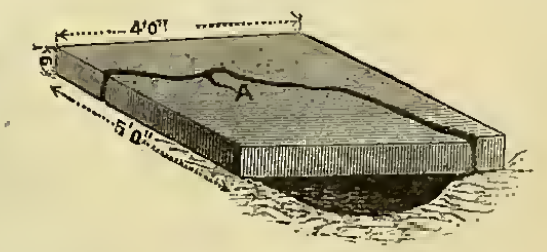


Fig. 2.

Unlike dynamite, roburite is said to be in no way affected by varying temperatures, and if duly protected against damp, it may be kept for years in any climate, without its efficiency becoming in any way impaired. It is also claimed by the manufacturers that roburite has an explosive force greater than dynamite by at least 25 per cent.

In exploding, roburite does not produce noxious gases, and, therefore, may be used without intermission, while the poisonous gases given off by dynamite often necessitate the stoppage of work, in some cases for a considerable time. This new explosive is applicable for use in mines and quarries, and for torpedoes and blasting operations generally.—*Industries.*

Iron Beams in Place of Wood.

Speaking of the large apartment house in New York lately condemned for dry rot (see illustration last November number of this paper), the *American Architect* says: A few of the floors were of spruce, and these, as might be expected, had resisted the rot much better than the hemlock, and were still sound, but the construction ought certainly to be changed. In view of the dangers from this source which attend efforts to provide fire-resisting floors of wood, it would seem that something might be done with light shapes of rolled iron beams. We have seen rolled floor beams used in Paris nearly as light as wooden ones of the same depth, and a tier of these, deafened with mortar on wire in the French manner, and wire-lathed underneath, with a wooden floor over, would cost little more than a solid mass of wooden beams, and would be proof against rot as well as fire.

BATHING ESTABLISHMENT AND CASINO IN VITTEL (VOSGES). BUILT BY CHARLES GARNIER, ARCHITECT, OF PARIS:

The casino is built of plastered quarry stone, with the exeeption of the socle, the balustrades, and the pillars, wbieh consist of gray Vosges sandstonc. The facade is ornamented with mosaics, and the roof is eovered with slate of two colors.

The bathing establisbment is eolored in Moorish style. Red briek bands in the socle, as well as the faience and mosiaes in the main eornice, stand out artistieally from the gray plaster of the walls. The roof is covered with red tiles.—*Architektonische Rundschau.*

The Back Yard.

Our immediate ancestors had their farm house, with its necessary aecompaniment of granaries, barn, ete We move to town and build our shingle palace or brick mansion, with its large front show window. in whieh the well preserved, gilt edged family Bible and the Rogers group have it whieh and t'otber for supremaey—and set up in our back yard, to represent the outbuildings of our ancestry, a privy, a pile of slabwood, generally as dumped, a few barrels. perhaps a cheap stable. Not then satisfied with the amount of decaying wood about the premises, we lay a lot of wood walk.

but are rather pleasing, indicating thrift, tidiness, and eomfort. But when we eonsider the opportunities they offer for tbe support of the vine morning glories, sweet peas. nasturtiums, climbing roses, and like forms of plant life, what a joyous recompense for so little labor and care. Then all the available baek yard spaee that is not used for walks, drives, etc., should give either vegetables or flowers - minister to the comfort or culture of the family.

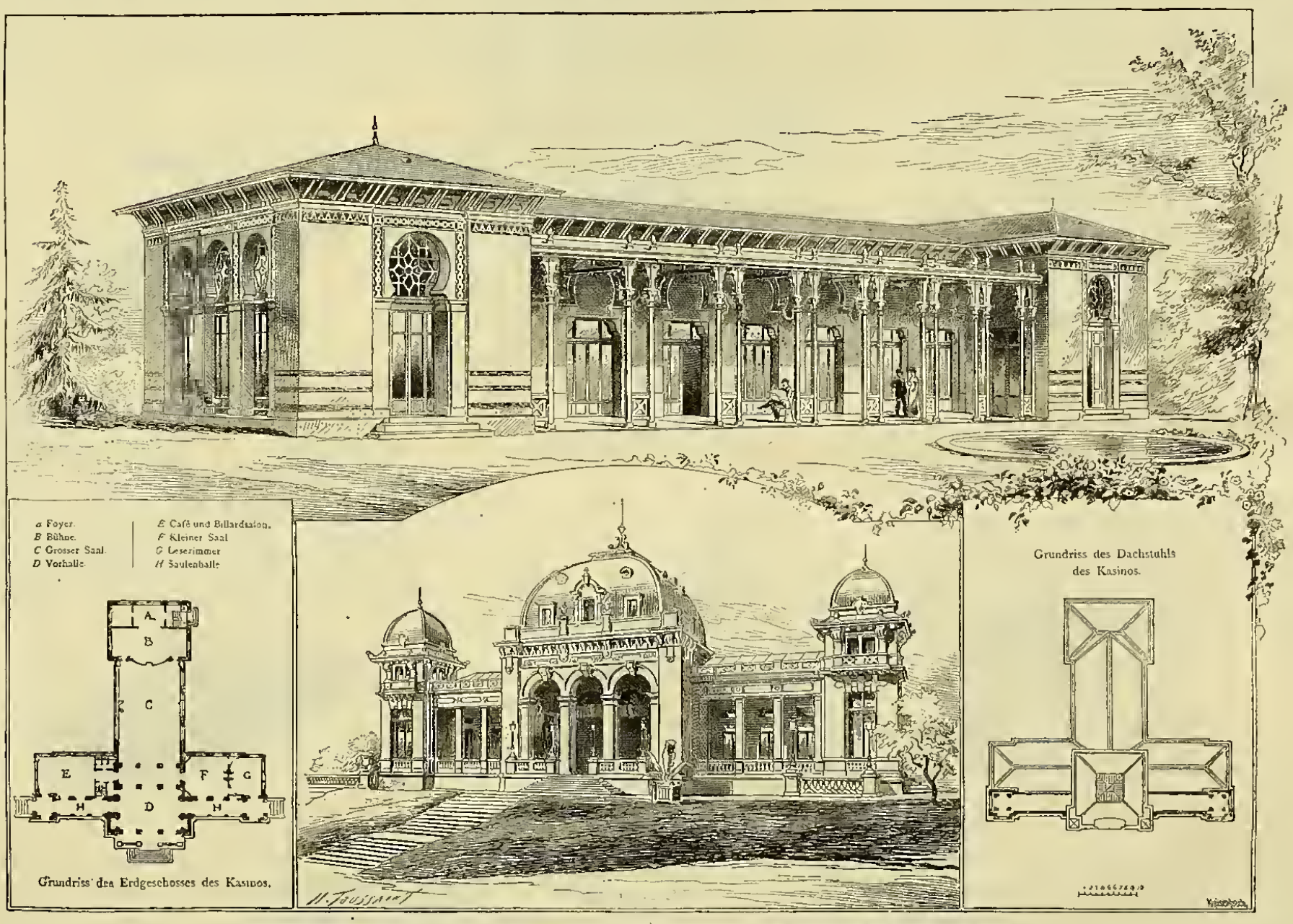
Listen to people who lament the bad influences of street associations upon the children. Yet they say. very reasonably, the children must have outdoor air, otc., and they have never eonsidered but that tbe only alternative from the housing of the children is the freedom of the streets. They do not know what moral education is eontained in a few feet of ground, congenial work for the hands, and the prettiest of life development studies for the mind. Give each of tbese street loving children a flower bed, a small set of garden tools, some flower seeds, and what help and adviee they need, and note if there be not germs of nobler thoughts and desires taking root at the same time in their fertile natures. But—to moralize a little—there is a kinship between tbe ornamented front and disgraceful rear of a residence and the fine clotbes and the false heart of the wearer, and we fear that the ma-

capitol was adopted, and he was appointed government architect. He removed to Washington, where he designed several prominent publie buildings, among them being the wing added to the Patent Office in 1851, the reconstruction of the Congressional Library building, which was destroyed hy fire in 1851, the extensions of the United States Treasury building in 1855. aud the Post Office in the same year, the dome of the national capitol, and tbe government hospital for the insane.

Pine Woods.

The sights and sounds of pine woods, the comfort and delight of walking in tbem, cannot be half told in a short paragraph. They are also as sanitary as they are pleasing and beautiful. It is said that the air of the Black Forest does more to revive and cure weakly patients than gallons of medicine; and from experience of the odors of pines at night, or in the early morning and dewy eve. I should say they were not only antiseptie, but strengthening as a dose of quinine. The living leaves, as well as the dead and slowly decomposing needles, redolent of healing and strengthening odors, bring baek the eolor to pale ebeeks and strength to semi-exhausted constitutions.

The sbelter of pine forests is also perfect. No matter



BATHING HOUSE AND SALOON AT VITTEL—CHARLES GARNIER, ARCHITECT.

Walking along the avenue, we see a pretentious residenee. It must be oeeupied by people of great refinement, for is not the most prominent room in the house the library, the whole street side taken up with an immense hay window, the glass reaching nearly to the floor? How splendidly it was lighted as we passed last night! What elegant sets of books on the sbelves! Plenty of pictures, too. Let us to-day take a look at the back yard. Why do not these people board up the windows at tbe back of the house? Here is a well with a dirty puddle by it, the pump standing on a rotting platform; hard by some kitchen garbage, farther on ashes, and so it goes, tbe whole rear of tbe lot so bad as to discourage vegetable life even. It is mercifully screened in part from the general view by a high, unpainted board fence, against which, now and then, a weed or tuft of grass grows. Where is there better field for the crusade?

The rear of the house and the outbuildings, though not so expensively finisbed, have a right to be carefully and artistically done. A woodshed is not a nuisance if inclosed, well boarded and painted, and the wood kept inside. A privy has no right to exist. If tbere be no proper system of drainage in tbe house for a water closet, partition off an earth closet from the woodshed or stable. Tasteful, well cared for outbuildings and fences are not only not an offense to the artistic sense,

jority of people who inhabit that sort of residence would rather risk some contamination of their children's characters than to see their faces, hands, and clothes besmeared with Mother Earth.

The back yard of the future will he a bower of flowers and greenery and the leisure hour resort of the family.—*N. W. Architect.*

Thomas Ustick Walter.

Thomas Ustiek Walter died at his home, in Philadelphia, on October 30, aged eighty-four years. He had been for some years president of tbe American Institute of Architects.

His first principal work was the new county prison, in 1831, now generally known as "Moyamensing Jail." In 1833 he made the original designs for Girard College, and was sent to Europe by the building committee of the institution. His tour through tbe principal countries was made for the specific purpose of the study of the principal buildings of the old world. Upon his return he took charge of the college buildings, which were finisbed in 1847, in accordance with bis suggestions, when be was also made one of the directors of the college.

Mr. Walter's next great public work was the breakwater at Laguayra for the Venezuelan government. In 1851 his design for the extension of the national

how the wind thunders and roars among the tops, calm prevails on the surface of the ground. Just as the waves of the ocean are, after all, limited to its surface while a perpetual calm rests on its deeper depths, so the turmoil of the storm exhausts its force on the tops of the trees, while the base of the boles are hardly moved by it. Hence the superlative value of pines in masses for shelter. The shelter of a large pine wood is unique in character, providing a local atmosphere as genial as it is pleasant. The elasticity of the dead needles seems to get into one's spirits, and enables one for the nonce to bid adieu to the cares and the ills of life. One saunters along under tbe shadow of tall pines without fatigue, and can rest on the clean, sweet carpet of dead needles and leaves with little fear of noxious weeds, insects, or malaria; and the whole air is deodorized and charged to the full with health-giving properties by the odor-distributing pines, that not only provide warmth and shelter, but health, to all who walk under or linger among them. Pine woods in England are mostly too small to furnish to the full all these advantages; but tbe black forests of Scotland, Germany, Denmark, Sweden, and Russia are massive enough to furnish shelter, shadow, rest, and health to those wise enough to seek for either amid their grand trunks or under their dense, dark masses of branches and leaves. —*The Garden.*

SKETCH FOR A COTTAGE.

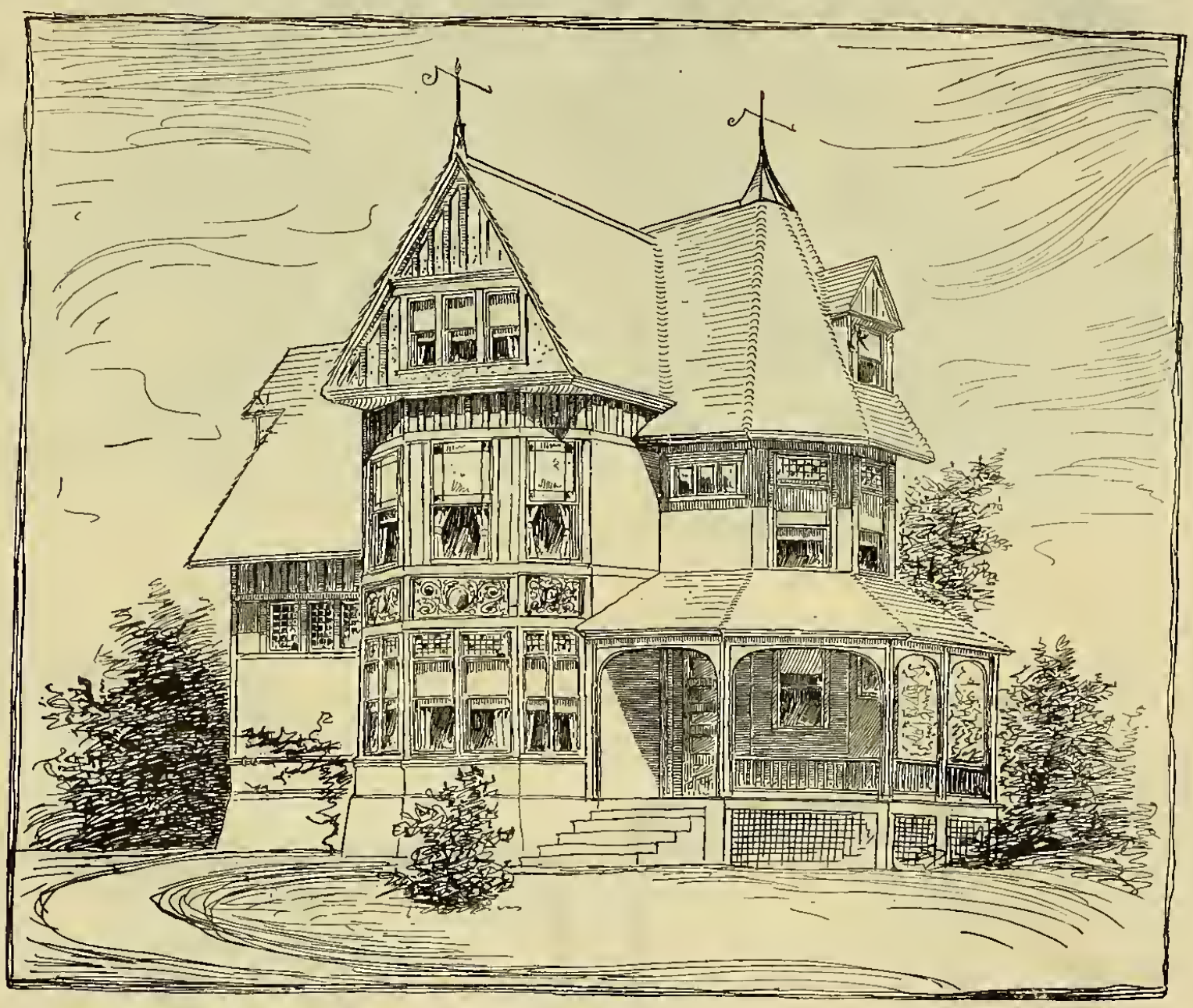
We give from the *Architectural Era* the floor plans and perspective sketch for a cottage which presents a number of attractive features. This house might be well built for $5,500, and perhaps less, depending on the locality and style of interior finish.

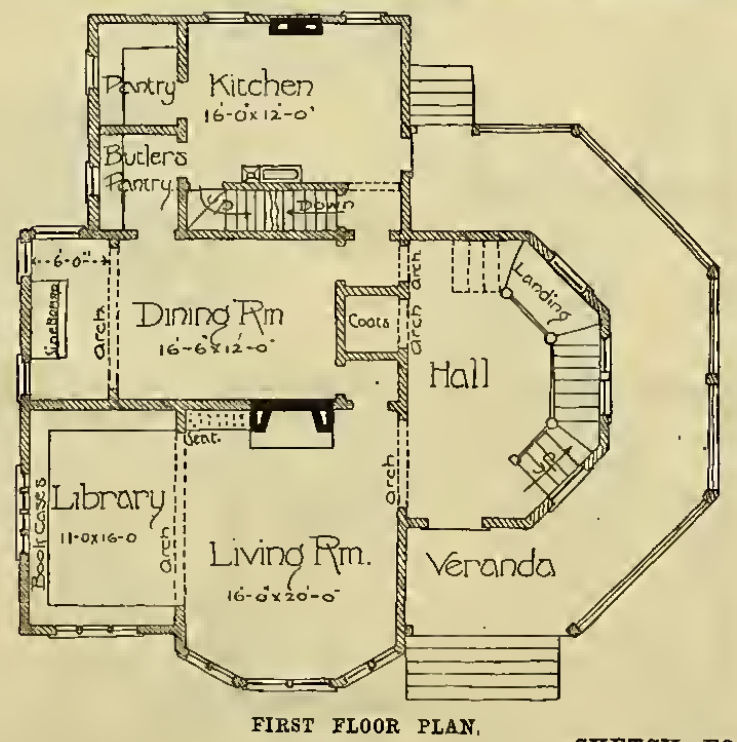
How We Have Grown.

When the history of the past seven years comes to be written, they will stand as years of the most marvelous expansion ever known in our history. Two of them, 1884 and 1885, were held as they passed to be dull years, but even these included great growth, and were a period of industrial readjustment rather than liquidation. The population of this country has not increased more than a fourth since the census of 1880, but house building, as an industry, has more than doubled, the number of common brick made in this country having increased from 3,800,000,000 to 7,000,000,000, worth $49,000,000. As the lumber trade has increased in less but large proportion, and iron production has risen over one-half from 4,300,000 tons in 1880 to 6,300,000 in 1886, it is certain that the past seven years have seen the most active building ever known in this country. Chicago uses one-seventeenth of the brick made in the country, and if its building represents the same share of the cost of house erection of all sorts in the United States, fully $2,000,000,000 have been spent on buildings in this country in the last seven years. As about the same sum will be reached by adding the building in the leading cities and estimating for the rest of the country, the truth is probably not far from these figures, which are under rather than over the mark. The railroad building since 1880 has cost, at $50,000 a mile, $2,700,000,000. This makes $4,700,000,000, or about one-tenth of the national wealth in 1880, turned into railroads and buildings in this country. As the residence and business real estate of the country, including water power, was valued in the census of 1880 at $9,881,000,000, and the railroads at $5,500,000,000, we have added one-half to the cost of the latter and one-fifth to the former in seven years, although the railroads represent the accumulated construction of fifty years, and the buildings are spread over an even longer period in their erection. This enormous increase has taken place without adding a bale to the cotton to be carried or a bushel to the grain raised. No more pork is produced now than in 1880, and the number of sheep is no greater now than then. Great increase has been made in cattle raised for food, in fruits, and, on the average, in canned goods. Coal, taking bituminous and anthracite together, has increased one-half from 70,000,000 to 106,000,000 tons. Copper has advanced in output from 27,009 tons in 1880 to 69,800 in 1886, and about the same this year. A great advance is true of nearly all mineral products, but in agriculture the United States has made little or no progress in product in the last seven years, but a great advance in acreage or the cost of cultivation.—*Philadelphia Press.*

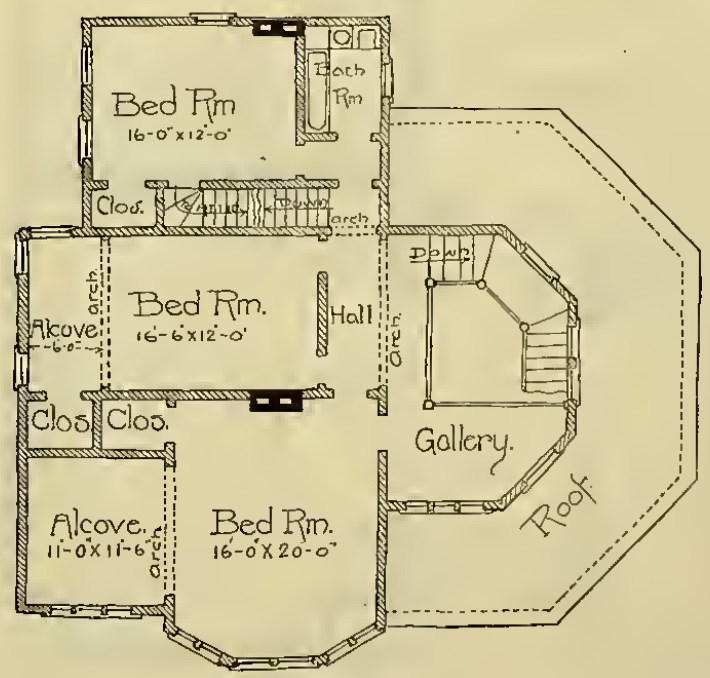
A Good Suggestion.

Charles Hardy, in the *National Builder*, says: Underestimating means working for nothing and forcing others to do the same; it means impoverishment and poor work. The contractor has himself and his family to maintain, and the temptation is great to get out by doing poor work. I would suggest that every contractor purchase an account book large enough to enter, line by line, upon a single page, every item of his estimate—giving quantity, price, and labor for each item. Let him leave opposite to this page a blank page, on which he may enter, on the corresponding line opposite, the actual amount of labor expended upon the item, and he will thus be able to see the result of his contract.





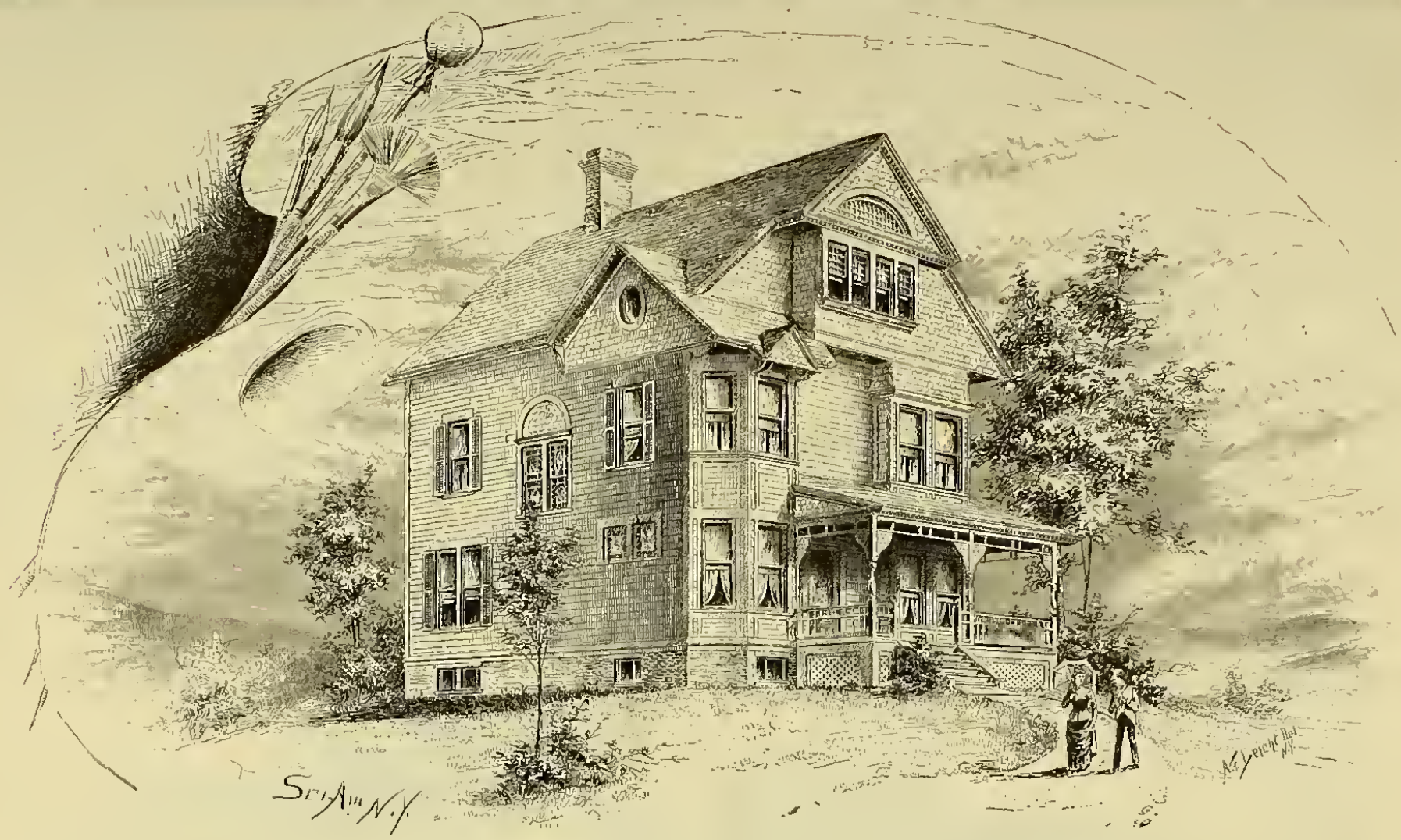
FIRST FLOOR PLAN.

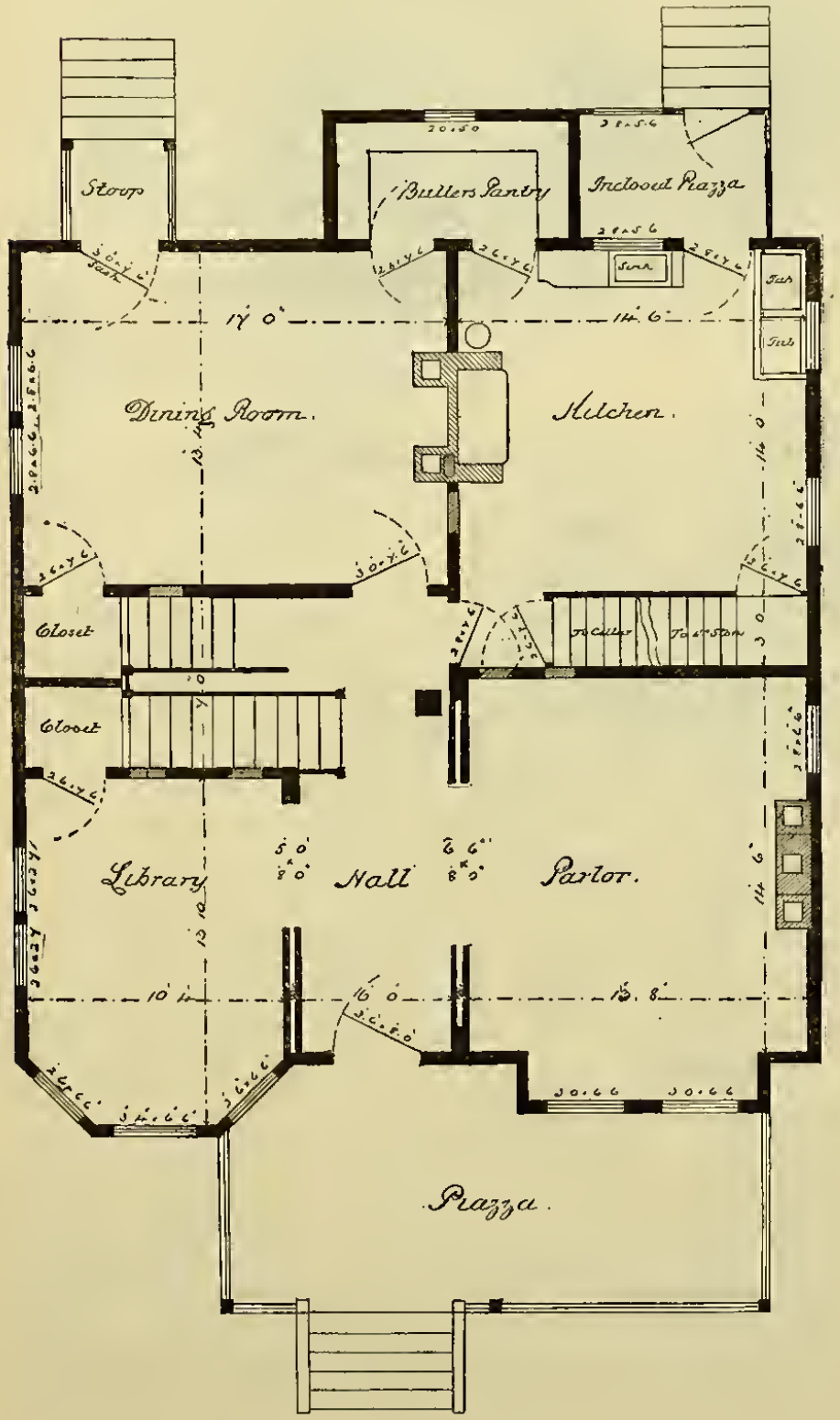


SECOND FLOOR PLAN.

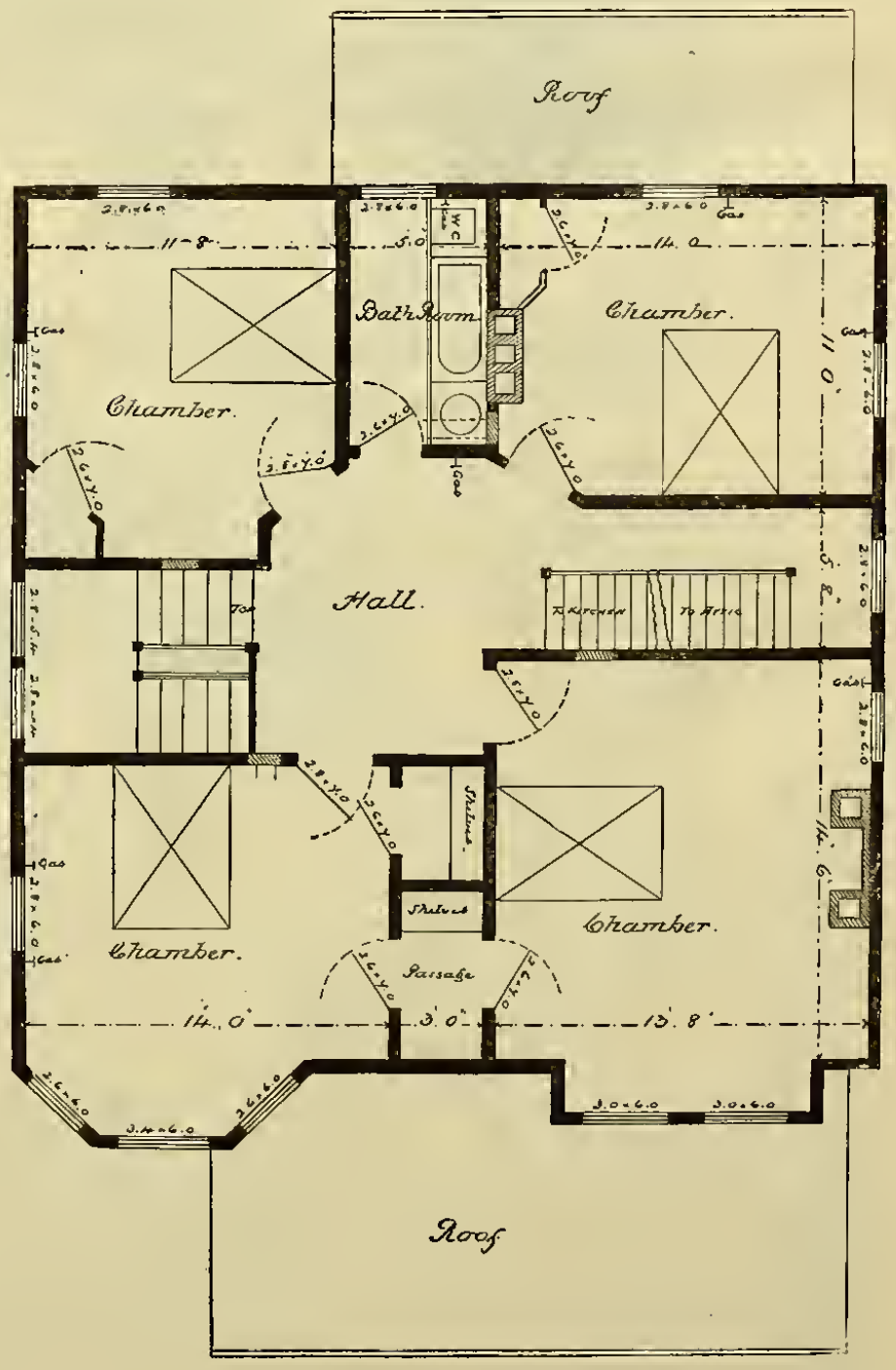
SKETCH FOR A COTTAGE.

A TOWER of Victory has been erected on the grounds of Washington's Headquarters, at Newburg, N. Y., at a cost of $35,000. It affords beautiful views of the Hudson, the Highlands, and the surrounding country.





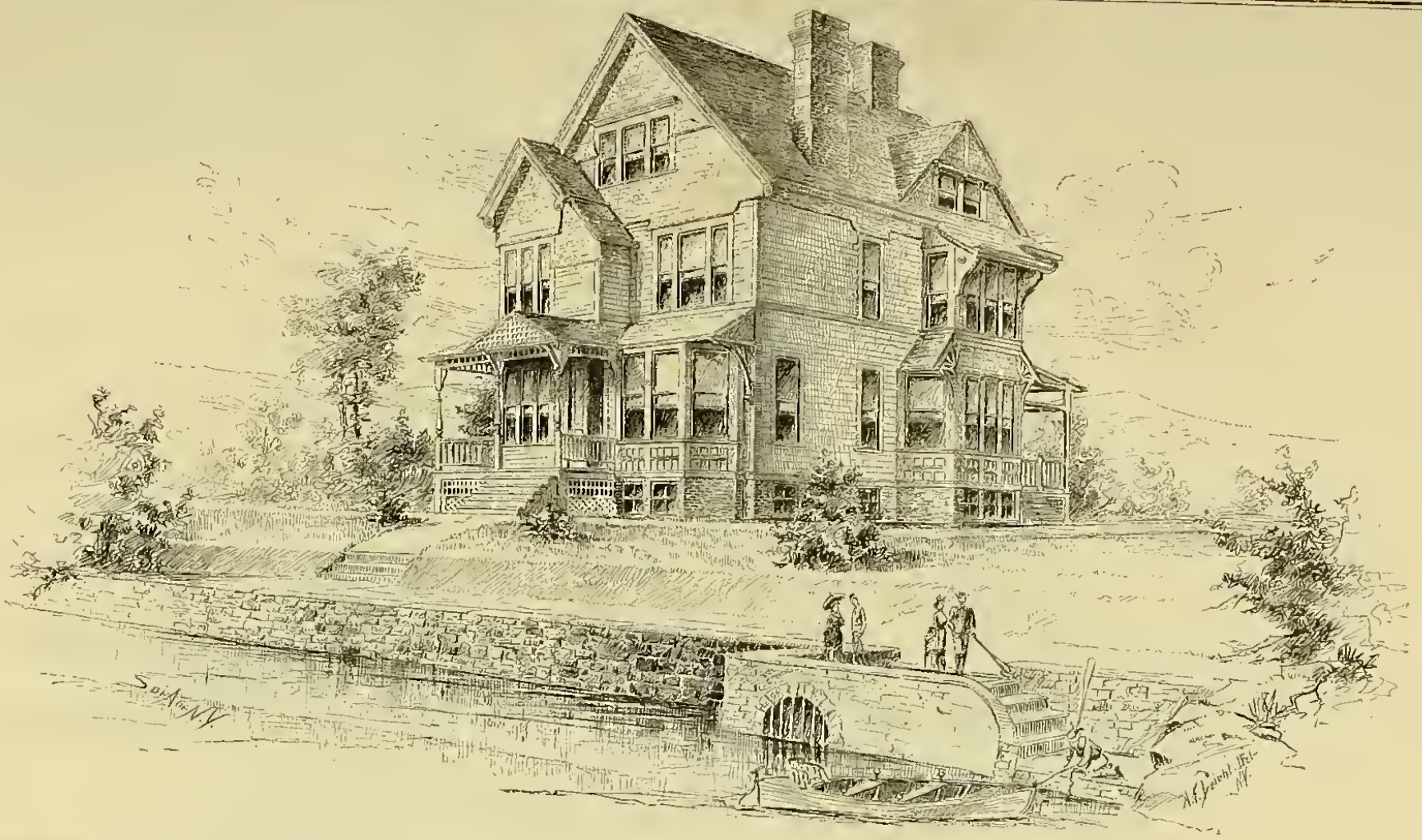
1st Story Plan

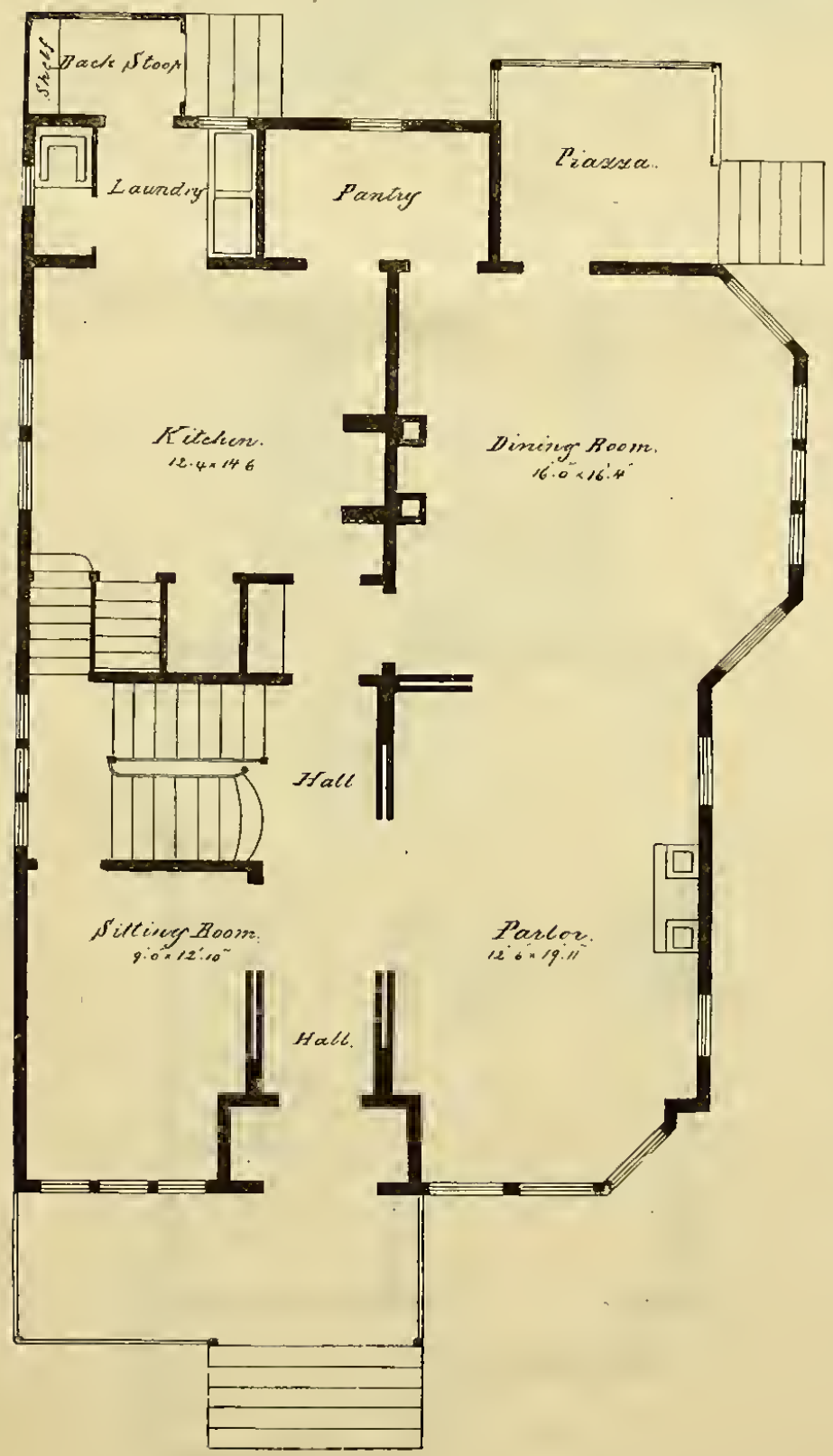


2nd Story Plan.

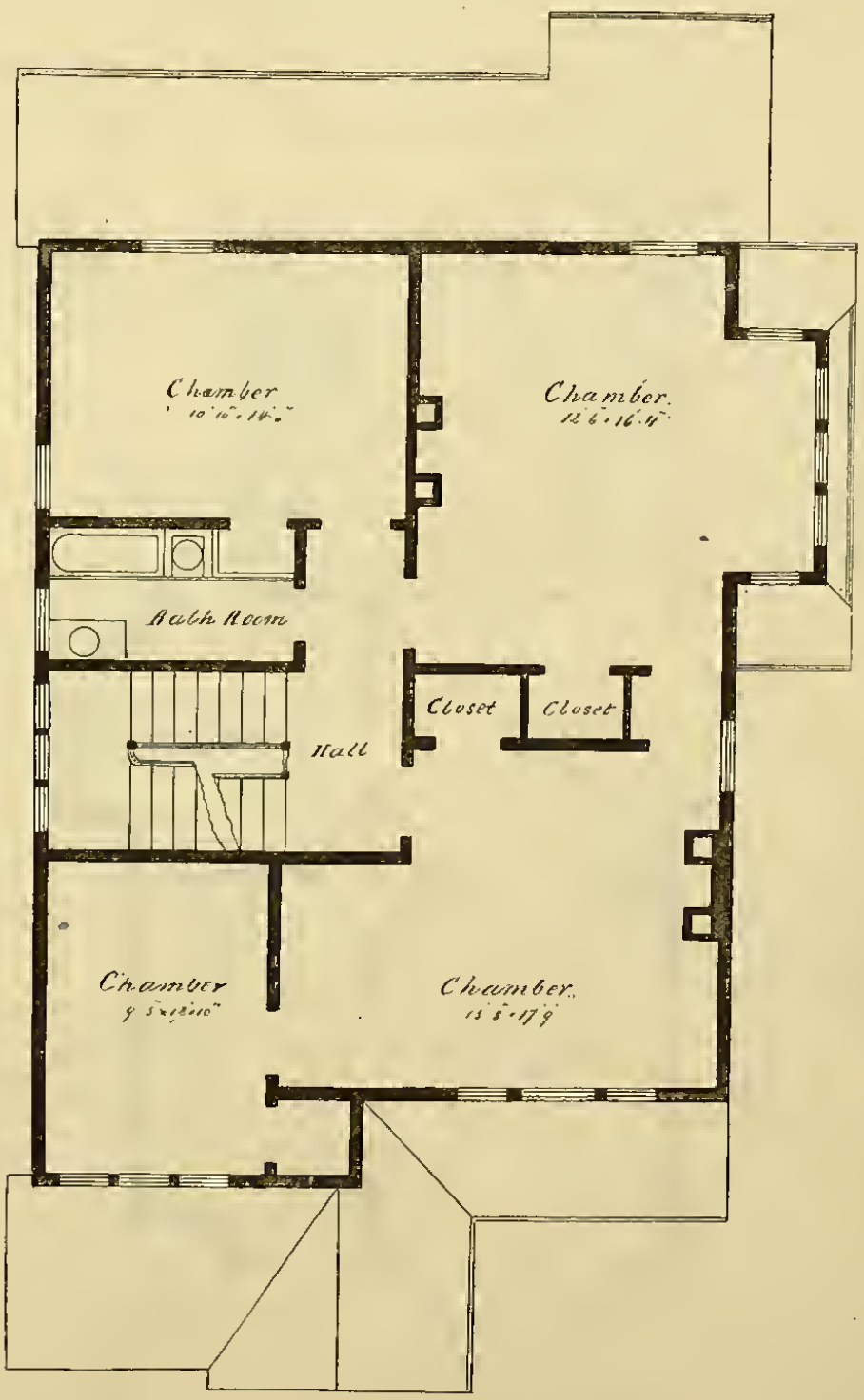
A COTTAGE FOR $4,200.

[For description see page 140.]





FIRST STORY PLAN.



SECOND STORY PLAN.

A RESIDENCE FOR $5,000.

[For description see page 140.]

A $4,200 DWELLING.

We give a perspective view and plans of a neat dwelling, the general dimensions of which are as follows:

Front, 29 ft. 6 in., exclusive of bay window; side, 48 ft. 9 in., not including piazza.

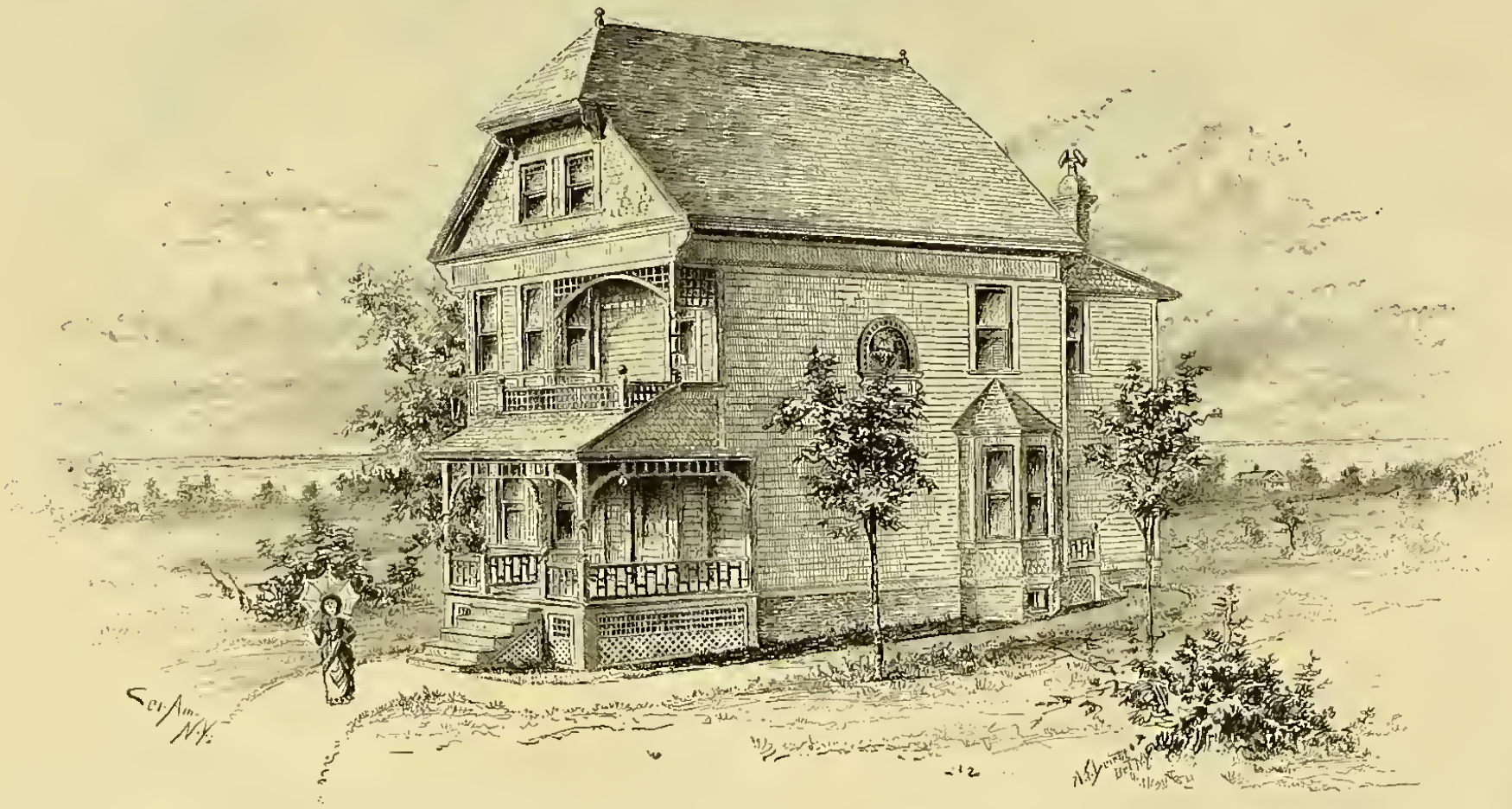
Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft. See floor plans for dimensions of rooms.

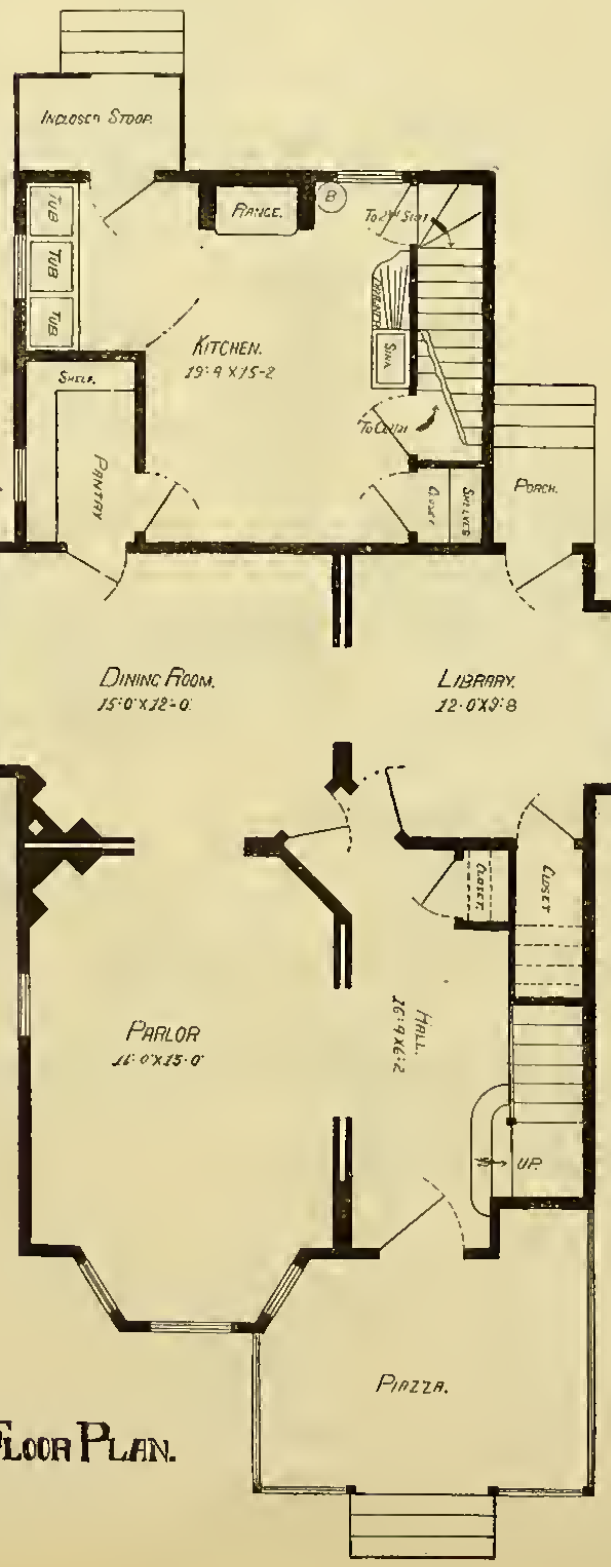
Materials. — Foundation, brick; first and second stories, clapboards; gables, cut shingles; roof, slate.

Cost.—Four thousand two hundred dollars, including furnace and mantels.

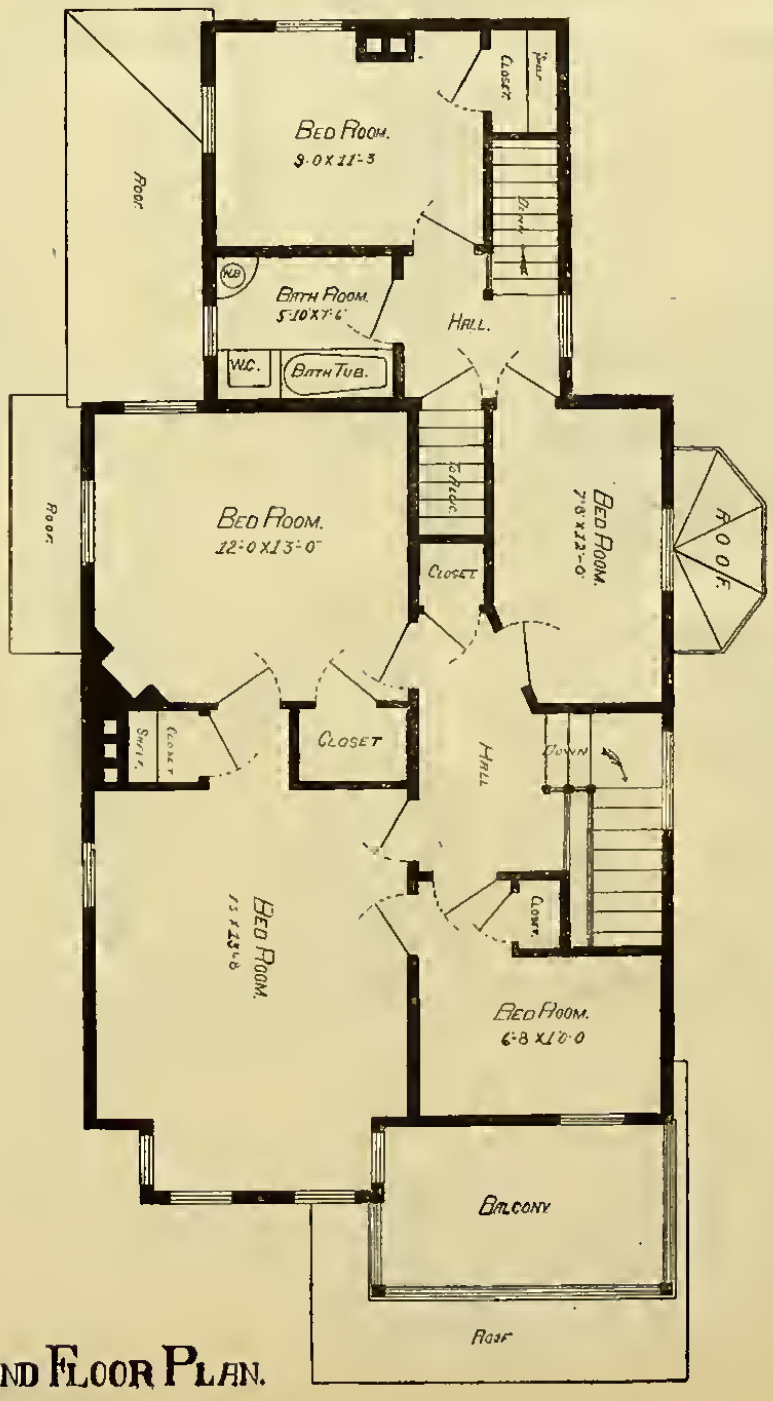
Fireplaces are provided in the dining room, parlor, and one bed room. The attic has two bed rooms, front room, and hall. Cellar under the whole house.

PROF. THOMAS, of Little Rock, has a curious library. The covers of the books are of wood, each a different specimen. They are made from white oak, red oak, black oak, chestnut, American beech, birch, red cedar, yellow pine, pitch pine, willow, poplar, cypress, "old field" or long-leaved pine, bois d'arc, black walnut, hickory (several varieties), white and red maple, box elder, black locust, black sumac, water locust, coffee bean, wild plum, holly, basswood, papaw, bay, umbrella, wild cherry, sweet gum, elm (several varieties), sycamore, witch hazel, butternut, pecan, hickory, and twenty or more other woods.





First Floor Plan.

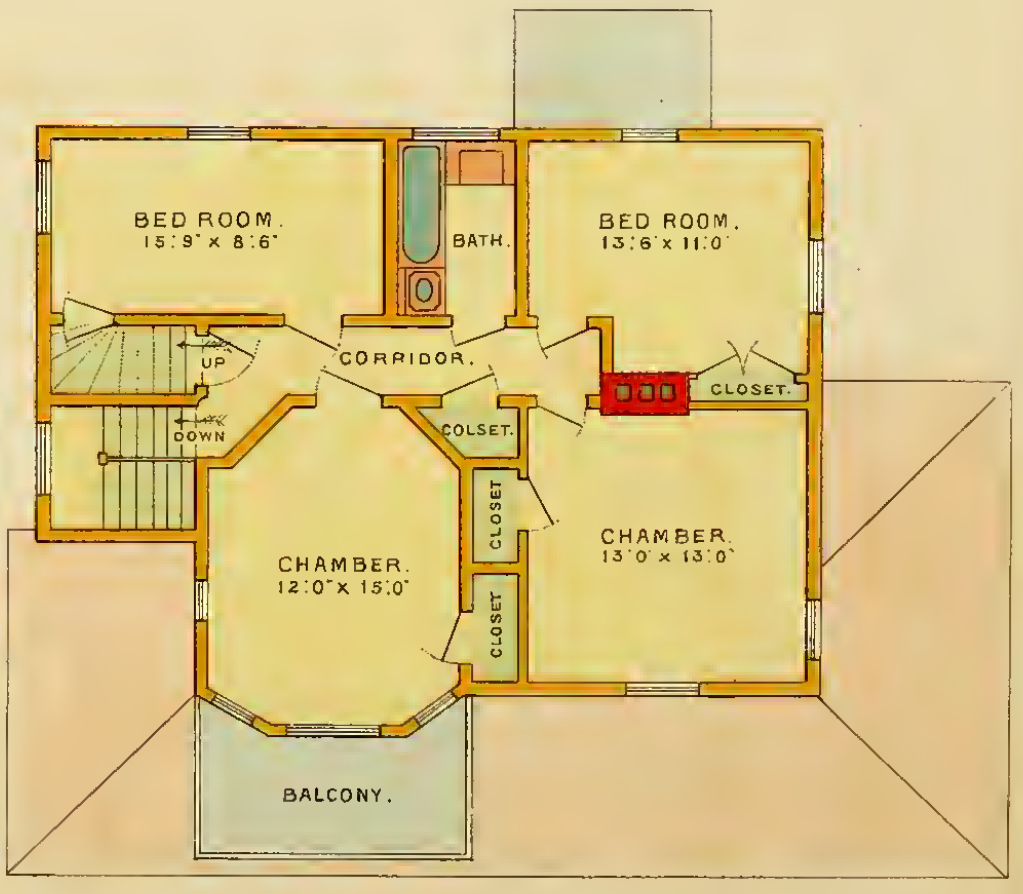


Second Floor Plan.

A $4,200 DWELLING.

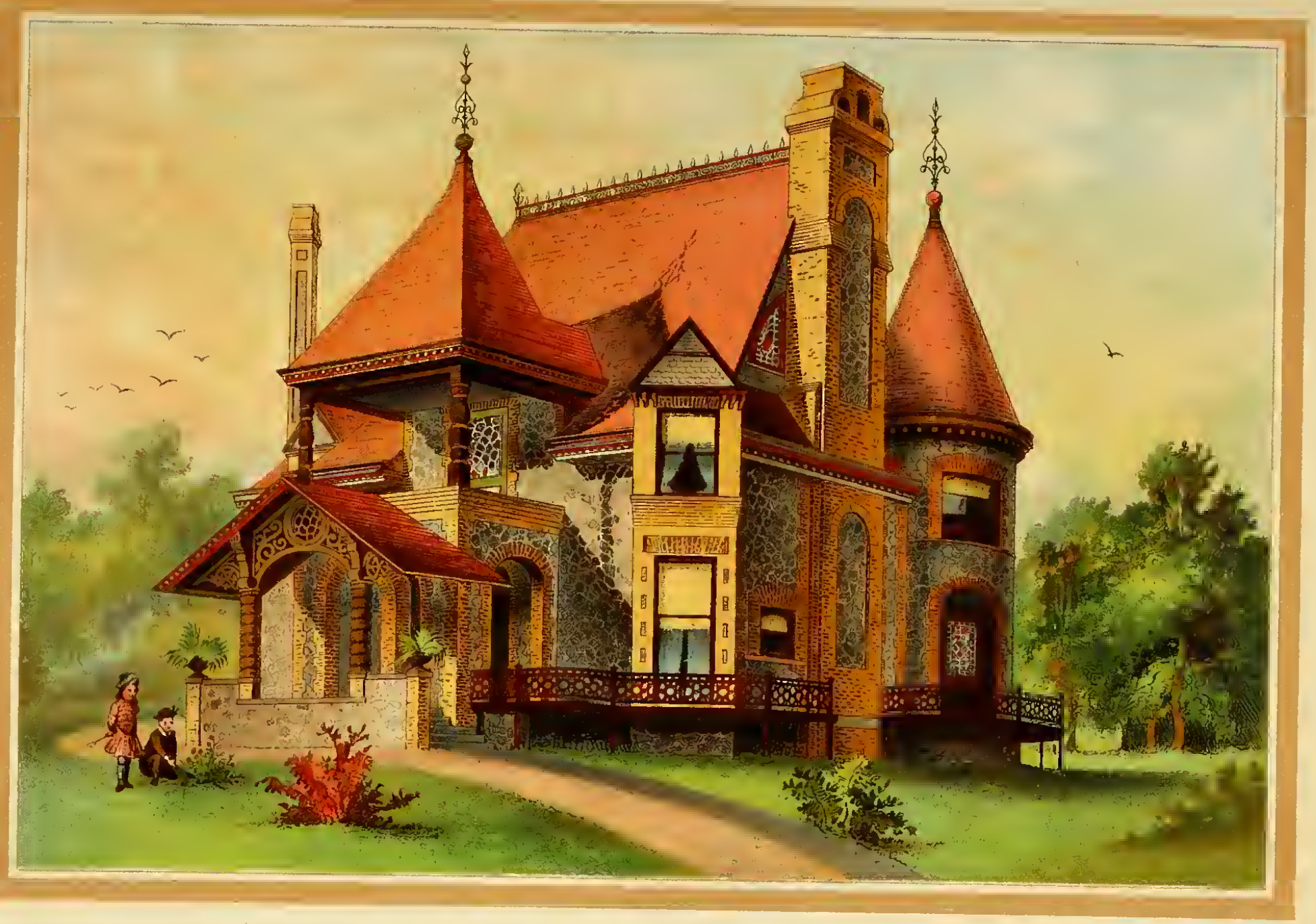
A DWELLING OF MODERATE COST

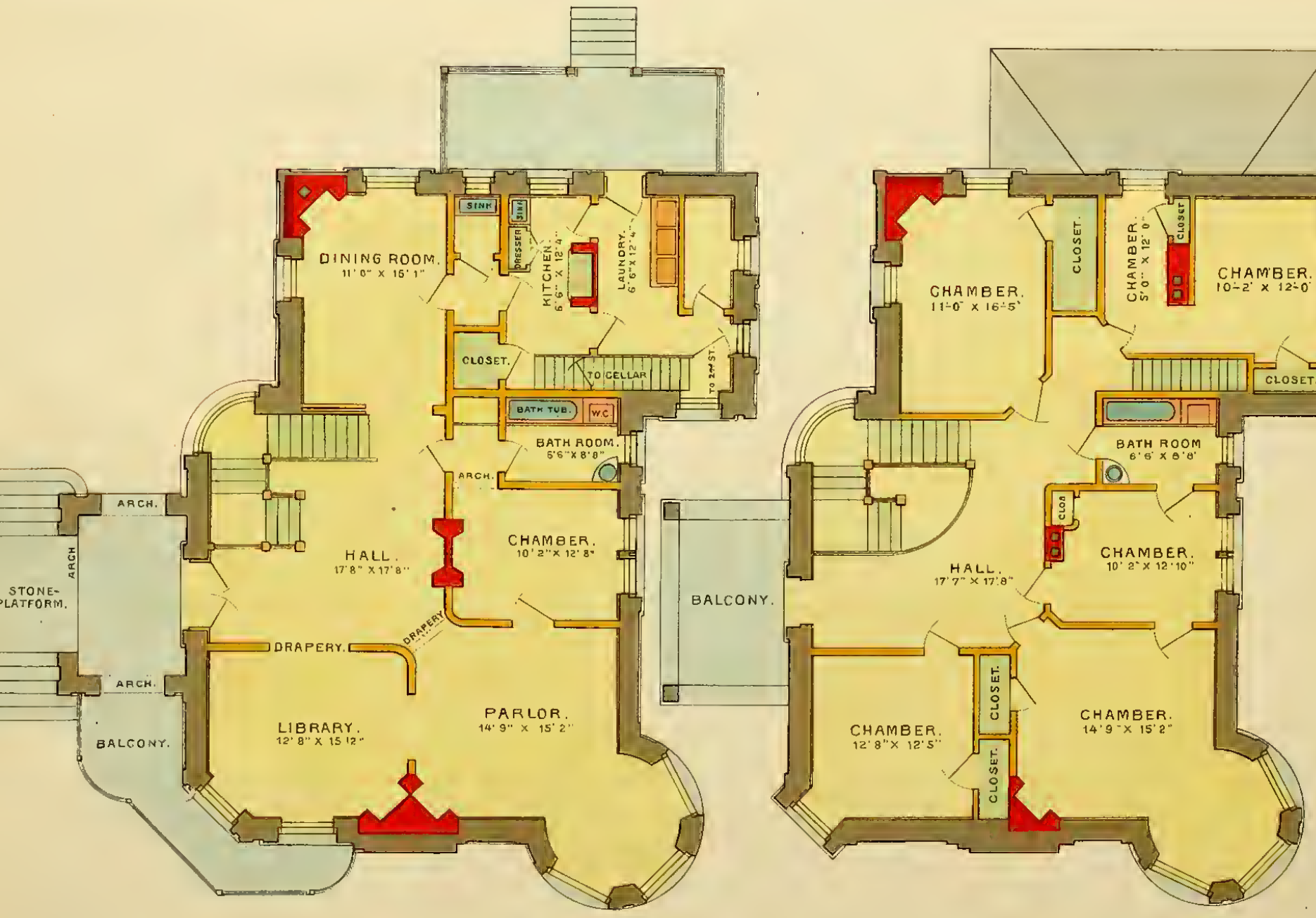
Plan of First Floor.



Plan of Second Floor.

A SUBURBAN RESIDENCE



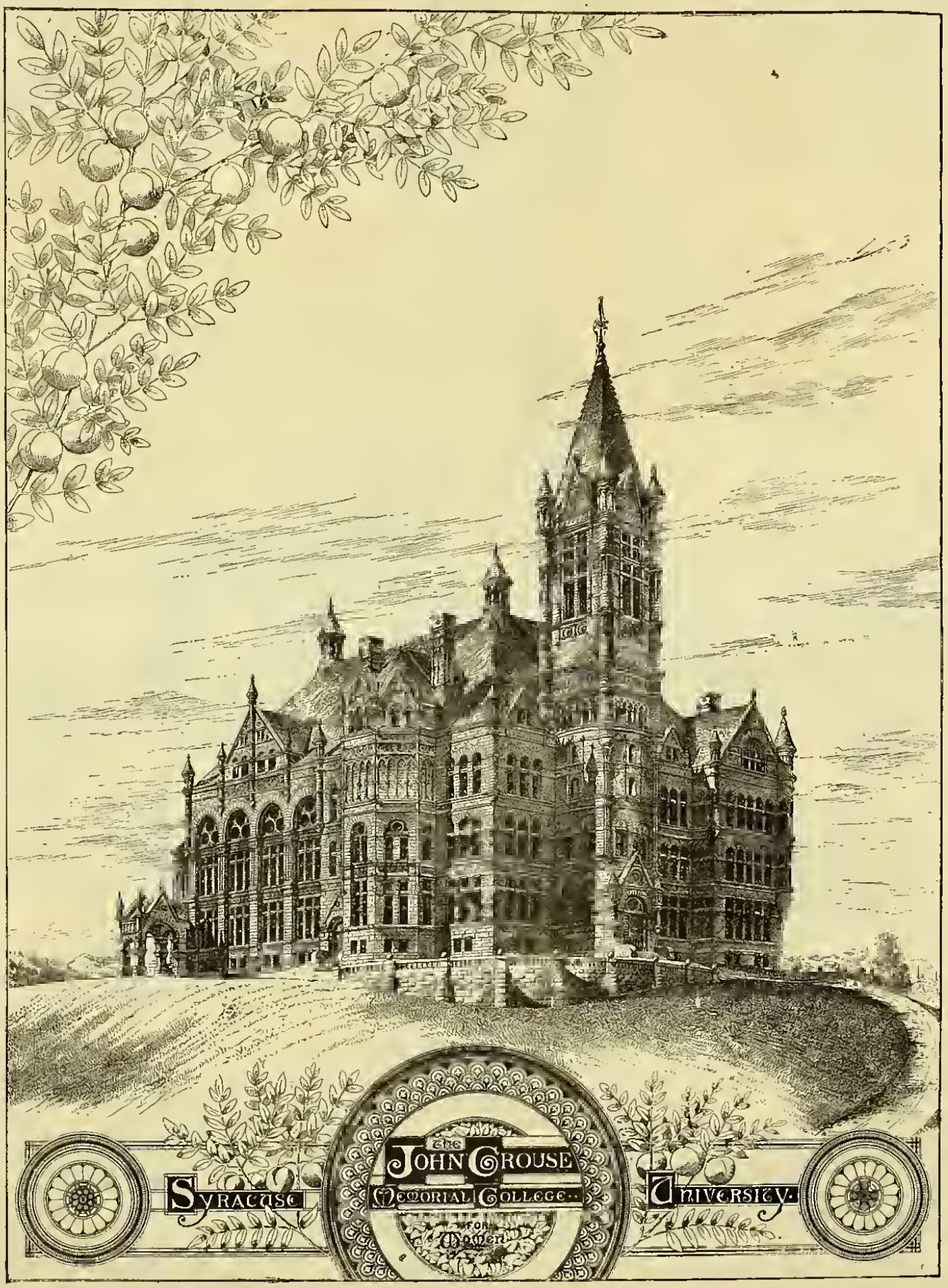


Plan of First Floor.

Plan of Second Floor.

THE JOHN CROUSE MEMORIAL COLLEGE FOR WOMEN.

We take pleasure in presenting to our readers an illustration of the John Crouse Memorial College for Women, which it is proposed to erect on the hill west of the Hall of Languages, Syracuse University, Syracuse, N. Y. This edifice is to be the gift of one of the wealthiest and most prominent citizens of Syracuse, Mr. John Crouse. The donor of this magnificent gift well deserves to be held in grateful remembrance by every friend and well wisher of the Syracuse University, as well as by the students and faculty. It is proposed to make this building a model one in every respect, and neither pains nor money are to be spared to render it the most perfectly equipped college to be found in the country. The structure is to be five stories in height, to be built of East Long Meadow brownstone, and to cover an area of nearly two hundred feet square.



ARCHIMEDES RUSSELL, Architect, Syracuse, N. Y.

In this connection a brief historical sketch of Syracuse University may interest our readers.

The college now known as Syracuse University had its origin in Lima, a pretty little village in Western New York, but quite out of the way, and not easy of access. It was then called Genesee College, and the first gathering of faculty and students occurred on Monday, June 9, 1851. The faculty consisted of Benjamin F. Tefft, D.D. LL.D. and Professors Houghton, Douglass, Whitlock, and Alverson. On June 12 of same year, the Rev. B. F. Tefft was inaugurated president of Genesee College, and on July 10 the names of thirty-eight students were enrolled on the college register. November 5 saw the faculty increased by the addition of Professors Hoyt and Fowler. The college thus organized continued with varying fortunes until July 7, 1871, when it disbanded. In 1866 the subject of removing the college from Lima began to be agitated, and the idea of a central university for the Methodism of New York was first publicly announced in the *Northern Christian Advocate*, during the year 1873. From this time forth the new enterprise met with great favor on all sides, except with the citizens of Lima, who were reluctant to see the withdrawal from their midst of their principal attraction, to which we may well believe they had become greatly attached, and who procured an injunction against its removal. Prominent members of the Methodist Central Conference were nevertheless commissioned to carry forward the good work, and substantial aid was soon forthcoming. Syracuse, being the most central city in the State, was finally settled upon as the most appropriate home for the new college.

The site now known as University Hill was secured, plans made by the well known architect, H. N. White, were adopted, and July 19, 1871, the contract for buildings were contemplated at such time as the finances of the university should admit of their realization. The institution has struggled along, sometimes meeting with reverses, but now and then being fortified and strengthened by the reception of substantial encouragement from some of its many and devoted friends. Now at last the wheel of fortune has suddenly turned in its favor, and it finds itself at the flood tide of prosperity, with the prospect before it of a long and honorable course of usefulness and well deserved success. University Hill commands a magnificent view of the belt of hills which girdle the city, with Onondaga Lake set like a sparkling gem in the distance. Upon the west hill an observatory has just been erected, and near the Hall of Languages a suitable building is in process of erection, for the accommodation of the fine and valuable library which has been generously bestowed upon it by one of its friends. Syracusans are proud of the University, and they, in common with its hosts of warm friends throughout all parts of the country, rejoice in the evidence of its well merited prosperity.

The alumni of Syracuse University have members not only in almost every State in the Union, but count among their number graduates from Canada, England, Mexico, San Domingo, Brazil, China, India, and Japan —*Architectural Era.*

How a Marble Statue is Made.

Mr. John A. P. Macbride, sculptor, who was introduced to a large audience, chiefly of workingmen, by Sir James Picton, recently gave a practical lecture on the above subject, at the Rotunda lecture hall, Liverpool. After giving a sketch of the art and its great antiquity, the lecturer drew a profile in chalk on the blackboard, which he filled in with clay, and proceeded to demonstrate the building up and modeling of a portrait bust of soft clay. He stated that there was a general and erroneous opinion that in taking a portrait bust it was necessary to take a cast of the face. This was a mistake, for the head lost all the spirit and go by such a mechanical process that should distinguish an artist's work. The truth was not always that which appeared to be true, and the sculptor had to convey some idea of the character as well as of the mind of the sitter; and a man who knew his work ought to be able to do so with his fingers. Carving was a secondary consideration. The lecturer then explained the process of pointing a marble statue. In this process, the model and the block of marble were each fixed on a base called a scale stone, to which a standard vertical rod could be attached at corresponding centers, having at its upper end a sliding needle, so adapted by a movable joint as to be set at any angle and fastened by a screw when set. The sculptor having marked the governing points with a pencil on the model, the instrument was applied to these, and the measure taken. The standard being then transferred to the block base, the pointer, guided by this measure, cuts away the marble, taking care to leave it rather larger than the model, so that the general proportions were kept, and the more important work then left for the sculptor's hand.—*Building News.*

ABOUT 5,500 buildings have been rebuilt and improved in Charleston, S. C., in the year since the earthquake, and 270 new buildings have been erected. This has been a busy year with mechanics and builders at Charleston, and about $3,500,000 has been expended in this work.

A STABLE COSTING $5,500.

We present herewitb front and rear perspectives, witb plans, for a handsome stable now being erected in Brooklyn, N. Y., from designs and plans prepared at the SCIENTIFIC AMERICAN office. The general dimensions are: Front, 40 feet; side, 25 feet. Heigbt of stories: First story, 11 feet; 5 feet breastwork in second story.

Materials.—Foundation, stone; water table, red granite; outside walls, red pressed brick; trimmings, buff brick; tower and gables, shingles; roof, black and red slate; inside wall finisb, enameled brick; ceilings and stable work, Georgia pine; cellar under carriage room. Cost, $5,500.

Special Features.—Space for six carriages in carriage room; accommodation for four horses; ample ventilation and light; stable connected by sliding door. Both floors are laid with 2 inch Georgia pine plank.

A Great Building.

Mr. J. L. Smithmeyer, architect of the Congressional Library building, states in his first annual report that the Congressional Library building when completed will be the largest structure in Washington, with the exception of the Capitol. It will cover 111,000 square feet of space.

In a building of such magnitude and importance, every step in the progress of the work must be carefully considered, lest fatal mistakes, due to hasty construction, should occur. It was deemed of the utmost importance to test every foot of ground supporting the foundation walls. For this purpose a traveling testing machine was constructed, which will give an accurate test of the entire soil. The tests thus far made have been most satisfactory, the soil standing a maximum pressure of 13·5 tons to the square foot, only 2·5 tons being required. These tests will be continued until the foundations are laid.

The method of testing the soil and putting in the concrete foundations may be briefly described as follows: First, the trench excavations are made by the contractor to the width and depth required by the plans, the bottom of the trenches being made perfectly level. Then the testing machine, consisting of a car bearing the required amount of weight in pig lead for making the tests, is placed in the trenches upon iron rails, which rest upon four cast iron pedestals, the latter being set four feet apart each way, each pedestal covering one foot of ground. Thus, one-fourth of the entire weight borne by the car rests upon each one of the pedestals, and the precise weight sustained by each square foot of ground is exactly determined. The soil being thus tested as to its resisting strength, is then ready to receive the concrete foundations.

A COTTAGE FOR $4,200.

We give on page 136 a perspective view and floor plans of a cottage costing $4,200. The general dimensions are:

Front, 32 ft.; side, 30 ft. 2 in., exclusive of bay window and butler's pantry. The size of rooms will be seen by reference to the floor plans.

The height of stories is as follows: Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

Materials.—Foundation, stone; first and second stories, clapboarded; gables, cut shingles; roof, slate.

Cost.—Four thousand two hundred dollars, including furnace and mantels.

This house is designed to be heated by a furnace. There are fireplaces in the dining room and in one front bed room. The attic has two bed rooms and hall finished, and garret. Cellar under the whole house.

A RESIDENCE FOR $5,000.

The house illustrated on page 137 has the following general dimensions:

Front, 31 ft. 6 in., including bay window; side, 43 ft., including bay window.

Cellar, 7 ft.; first story, 10 ft.; second story, 9 ft. 6 in.; attic, 8 ft. The floor plans show the sizes of the rooms.

Materials.—Foundation, stone; first and second stories, clapboards; gables, cut shingles; roof, slate.

Cost.—Five thousand dollars, without heater and mantels.

It may be heated by a furnace. There are fireplaces in the dining room and in one chamber. The attic has two chambers and hall finished. Cellar under the whole house. Water closet off the laundry, and private stairs from kitchen to platform of main staircase.

Proportions of Rooms.

There are few objects connected with our art that have been more frequently dwelt on by those who have undertaken to be our guides and monitors than the right proportions to be given to rooms. Vitruvius led the way, and subsequent theorizers have laid down, sometimes very dogmatically, their views of just proportions. I find, however, in the actual practice of the ablest men such extreme diversity, and I observe pleasing effects producible by the adoption of such widely different proportions, that I find myself, I confess, much inclined to be somewhat incredulous of all these theories. Certainly if beauty could be thus reduced to a formula, and the proper relation indisputably established between the length, breadth, and height of every room, a royal road would be cleared for us, which would be at least very convenient both to those who teach and to those who learn. I fear I can scarcely hope to furnish you with such a desirable help in your studies. I find rooms of universally admitted beauty, yet of almost every geometrical figure. I have heard of the room in the museum of Florence, the Tribune it is called, which contains the Venus di Medici, spoken of in terms of rapturous approval for the beauty of its form and proportions. This saloon is an equilateral octagon on plan. I have known square rooms greatly admired—such, for example, as the saloon in Cobham Hall, which is usually pointed to as one of the *chefs-d'œuvre* of Inigo Jones. Who is there that is not charmed with the proportions of the Pantheon at Rome? This, you know, is circular. The classical teacher of our art, Vitruvius, seems to contemplate only rectangular forms, and directs us to adapt the double cube and the cube and a half, whether for a temple or a triclinium.

The Sistine Chapel, attached to the Papal Palace, upon which the best art of Italy in its best days was expended, is a triple cube, viz., 133 by 44. While of modern French, Italian, and English teachers, each seems to have his own special favorite proportion. The truth I believe to be that, so bounteously have we been endowed, and so liberally have the laws of beauty in form and proportion been framed, there exists in fact an endless variety of beautiful forms and proportions. My impression is that it is as little consistent with truth to lay down any one definite form or proportion as the best as it is to extol any one particular curve as the line of beauty. I believe that there are as many pleasing proportions to be given to rooms as there are pleasing harmonies of color and sound. The purpose of a room must always be an important guide in determining the form and proportions to be given to it. If planned so long in proportion to its width as to remind us of a passage, it loses its distinctive character, and creates a false impression, which it can never be good art to do. It is indeed obvious that a consideration of the special fitness of a room for its destined uses must always greatly influence its proportions. The octagon form, so much affected by our ancestors in planning their chapter houses, owes its origin probably far more to the propriety of that form for a chamber intended for the convenient assemblage of the members of the chapter sitting in council than to any intrinsic architectural beauty, however unquestionable that beauty may be.—*S. Smirke.*

A STABLE COSTING $5,500—FRONT VIEW.

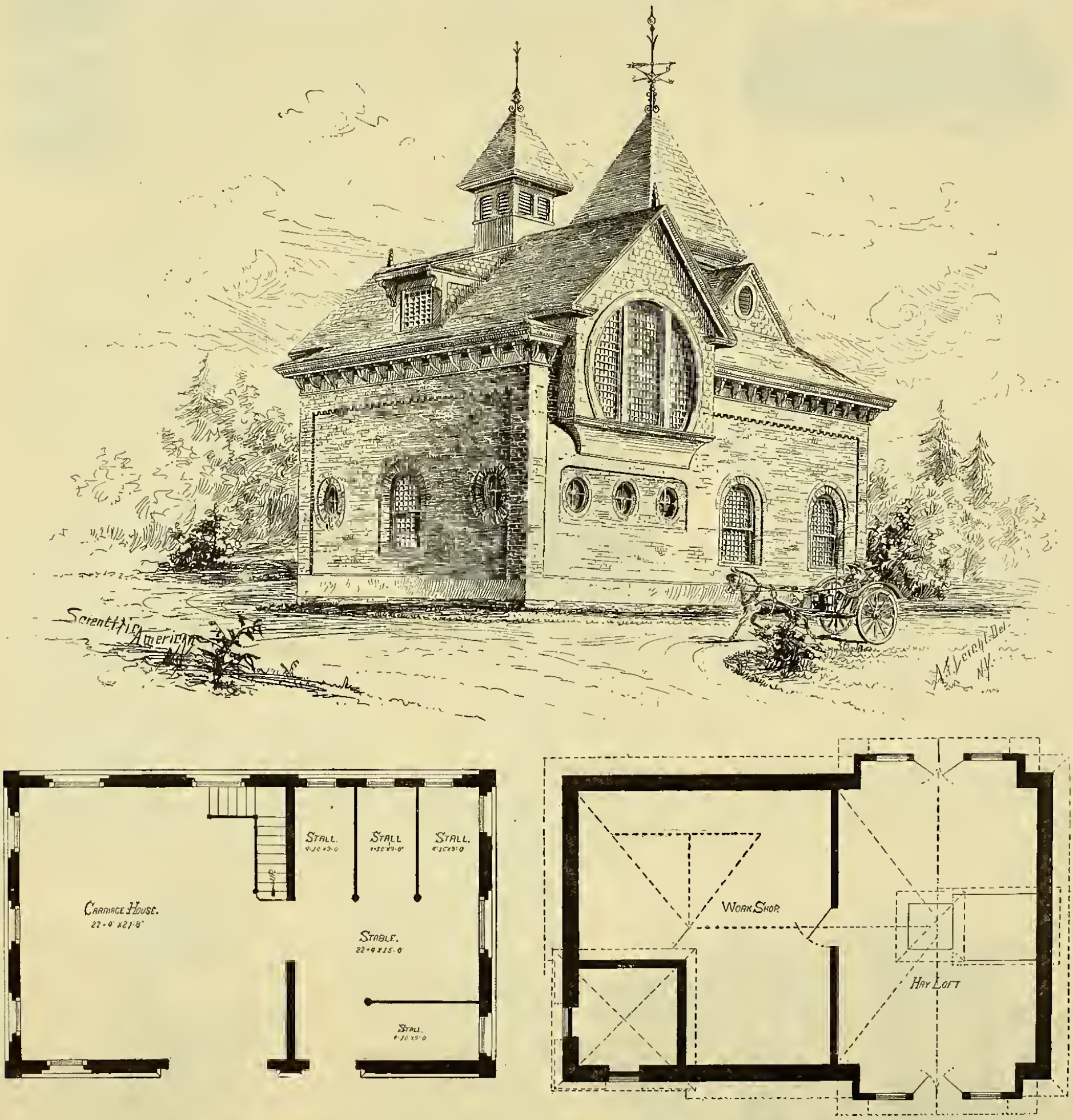
THE *Firemen's Herald* says fire protection, like charity, should begin at home. However efficient may be the public service against fire, a single bucket of water properly administered may stop a fire that all the efforts of the brigade would be unable to quench, and besides, the jet of a powerful engine is as destructive in its way as fire to all perishable articles within a room, such as furniture, pictures, and bric-a-brac.

Plants for Room Decoration.

The universal custom now prevailing in most establisbments of having a few plants in addition to eut flowers dotted about the different rooms induees me to write a short paper thereon, not only beeause it has developed into a very important part of the gardener's work, but it likewise requires a fair share of taste in the arrangements, as well as suitable plants for the purpose. Generally speaking, each room being differently furnished will require a different elass of plants for its adornment, but, as a rule, plants with stiff, upright growth are objectionable to the eye, as they do not hide the pot or stems unless others of a dwarfer growth are associated with them; therefore they should only be used when possessing speeial features either in flower or foliage. Too many plants in a room are objectionable, because they detract from ra!her than elevate or enhance the effeet, especially if the room is elaborately furnished. For instanee, plants assigned to the front hall or corridor would be unsuitable in a drawing room or boudoir.

Another important matter to study is the various kinds of reeeptaeles provided for the use of plants. These vary in size and shape greatly, but are generally of a fanciful, elaborate, and artistie design, and the plants for these should he selected with the greatest eare and taste, so as to add a eompleteness and finish, and in no way hide or diminish the effeet of their appearanee. I have often found, however, a great difficulty in getting plants to go in them without taking them out of the pots, and in many cases I have found it necessary to reduee the ball of roots in order to fit the latter in properly. This quite ruins the plant, for, in the case of choice or delicate growing subjects, it is almost impossible for them to reeover. But in order to meet this diffieulty, it is advisable to make a seleetion of plants, grow them in suitable sized pots, and use them for no other purpose. To do this it requires a sufficient number for three changes; say, if twenty plants are required at one time, sixty should he grown, and duplicates of all to be grown to follow on.

The atmosphere of rooms is generally dry, though warm, and impregnated with gas and other enemies to plant life. So different is all this to the bealthy atmosphere of a plant house, that it is neeessary that every plant used should have eompleted its growth, or some injury will follow. Take the different varieties of adiantums, for instanee. If used for the decoration of rooms in a growing state, the young fronds would most eertainly he injured; yet, when properly prepared, there are no more popular or suitable plants for the purpose, and they can be grown to a useful size in small pots. Nephrolepis exaltata, though not so choice as others, is a most handsome fern to use. Its long and graeefully drooping fronds are an ornament in any position, while many of the Pteris family have a fine and graceful appearance, and may he used freely. Nice plants of Spiræa japonica with or without flowers are very ornamental. The different sorts of lyeopods make perfect plants for small vases, as also do the artillery plant (Pilea museosa) and the little Caladium argyrites. In fact, there is no laek of either foliage or flowering plants suitable for a tasteful arrangement either in a drawing room or houdoir, while for more commodious places, such as the entranee hall, corridor, or staircase, and where larger plants are admissible, there is tbe beautiful Caladium eseulentum, with noble foliage and which stands well, several sorts of palms, the larger fronded ferns, eurculigo, Fieus elastica, Hihhertia voluhilis, and the ealla or Ethiopian lily, all of which have a reputation for retaining their beauty hetter than many others, and therefore should be grown for the purpose. But to avoid as little injury as possible, freqtent changes are necessary, and it is a very good rule to water every plant well before it is used, and when it again needs water change it for another. Let all pots and plants be kept very elean, and avoid letting the plants remain long enough to make growth in the different positions, for such growth, when brought out to the light, is generally very weak.—*Thomas Record, The Garden.*



FIRST FLOOR PLAN. SECOND FLOOR PLAN.

A STABLE COSTING $5,500—REAR VIEW.

THE WAINWRIGHT HORIZONTAL FEED-WATER HEATER.

We illustrate herewith the Wainwright Horizontal Feed-Water Heater, adapted for use in a borizontal position under the floor of an engine room, or wbere the head room is limited. The feed water enters at the lower opening marked "feed," fills the body of the heater, and having been beated by the exhaust steam surrounding the tubes, passes to the boiler at upper opening marked "feed," the exbaust entering at either end. A drip pipe, as sbown, is provided for escape of the water of

HORIZONTAL FEED-WATER HEATER.

condensation, and a hand hole for washing and cleaning. It will be seen that this heater contains a large body of water well disposed to receive heat, the tubes, being of corrugated copper, present 50 per cent. increased heating surfaee over plain tubes of the same length, while at the same time five times the strength is added, and owing to their property of expansion and contraction, all danger of the ends pulling out or the joints working and leaking is eliminated. This property of expansion and contraction also prevents any accumulation of scale and sediment.

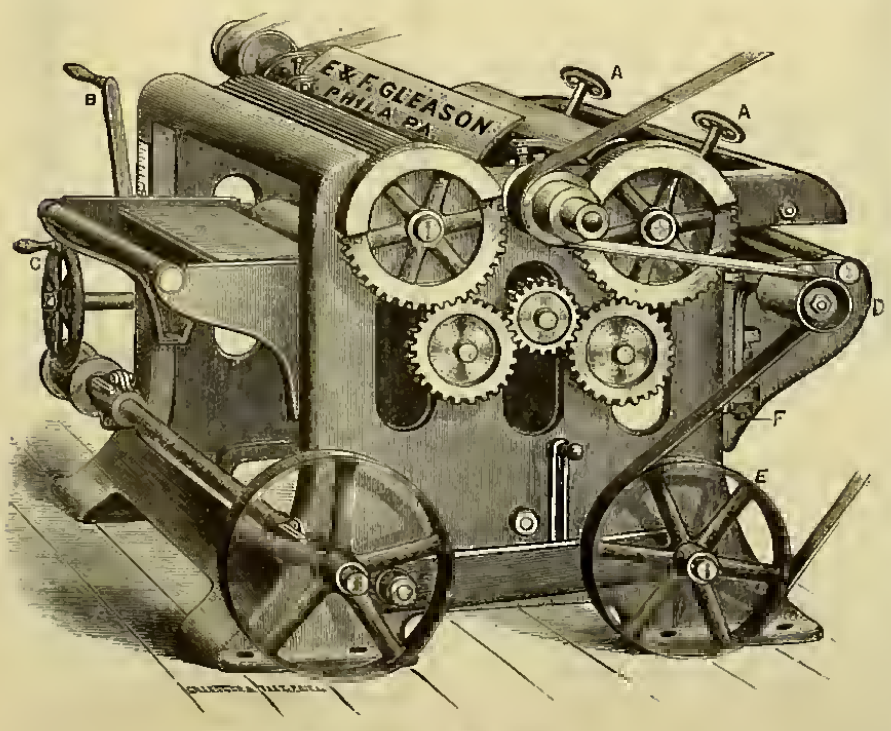
These heaters are manufactured by The Wainwright Mfg. Co., 65 Oliver St., Boston.

The Charter Gas and Gasoline Engine.

This gas engine, manufaetured by the Williams & Orton Manufacturing Company, of Sterling, Illinois, possesses various features that must commend it to the attention of all interested in the production of power from gas. It is eharacterized by great simplieity, having no gearing, so that it is practically noiseless. It has a power and a supply cylinder, one plaeed over the other, and eaeb working or worked by its own crank. An impulse is given at every revolution of the wheel, and by the governing device the amount of gas consumed is regulated in proportion to tbe work done. The ignition valve is easily aeeessible, and needs no adjustment on starting the engine. It can be used either for gas or gasoline. For tbe latter, a few drops are aspirated at eaeh stroke into the cylinder, where mingling with the air they form the mixture for ignition. The gasoline can be kept in a tank outside the building, and is subjeeted to no eontact with the flame until it has been thoroughly vaporized and has entered tbe working eylinder.

AN IMPROVED DOUBLE SURFACE PLANER.

A four-roll machine that is simple and durable, and all geared with the most improved extension gearing, is shown in the accompanying illustratiou, as made by Messrs. E. & F. Gleason, manufacturers of improved wood tools, American Street and Susquehanna Avenue, Philadelphia, Pa. Both heads are driven with one counter, and only two belts are required, the adjustment of bed and control of feed being both on left-hand side of machine, at B C, within immediate reach of the operator. The bottom head is quite as easy of adjustment as the top head, having large screws, F, one at each box, to regulate cut or chip and keep it in line with bed and top head, both heads having self-oiling boxes. The machine will double-surface stuff from one-eighth inch to six inches in thickness. It occupies a floor space of about four feet by forty inebes. The eounter sbaft bas patent self-oiling hangers and patent self-oiling loose pulleys.



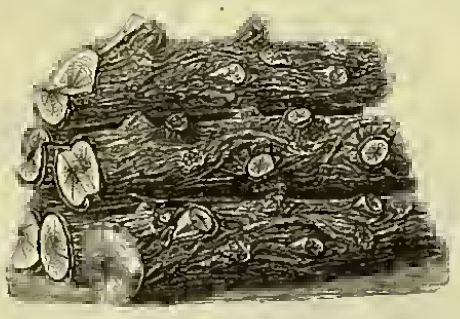
GLEASON'S DOUBLE SURFACE PLANER.

Foundations in Wet Ground.

A new method of making foundations in wet ground has been devised by M. Bonnetond, a Freneh military engineer. His plan is to bore a hole 10 ft. or 12 ft. deep and 1½ ft. in diameter in the damp ground, and in this a series of dynamite cartridges are placed, and finally exploded. The expansion of the gases generated drives the water far out beyond the sides of the hole, into which it does not return for at least half an hour. The time thus gained is utilized in rapidly excavating the eavity, whieh is then filled with a eement concrete, which sets hefore the return of the water. The method has been adopted in the construction of a fortified enceinte at Lyons, and is said to have led to very rapid work.

HOW TO MAKE A CHEERFUL FIRESIDE.

In the accompanying illustration is sbown one of several forms of arranging artificial sticks or logs in a fireplace for burning gas, to give a close imitation of a blazing wood fire, which has been patented and is made by Henry P. Dixon & Co , of 1330 Chestnut Street, Philadelphia. Several other forms of logs and grouping are also made, the sticks and the logs being colored to resemble wood, and having fixed between them splints of ashestos, which become incandescent when in use, so that when tbe gas is turned on and a match applied to the small jets arranged to the best advantage over and between the logs, it gives the appearanee of a first elass wood fire. These artificial logs are made of material not injured by the flames, and are designed to last a life-time without craeking or breaking, the gas



ARTIFICIAL LOGS FOR FIREPLACES.

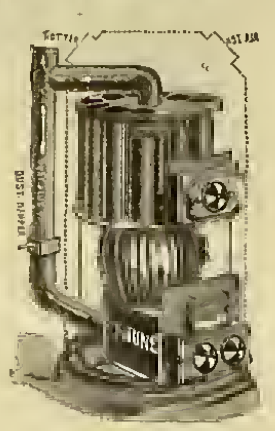
being supplied through a brass union fixed in the back of each log, through which connection can be readily made by rubber tubing or otherwise to the nearest gas pipe. A good, eheerful fire, whieh makes neither dust, dirt, nor ashes, is tbus ever ready at hand and available by simply turning on and lighting the gas, tbe flow of whieh is regulated as desired.

The Sounding Board in St. Paul's Cathedral.

The form of the sounding board is, I think, a novelty, but I am led to believe that it is an approaeh to the true form for the purpose. Flat sounding boards have been most eommonly tried, but they are now geuerally discarded. A parabolic sounding board behind tbe preaeher has been used with a certain effect, but the advantage is limited to tbose in the direetion of the axis of tbe curve; and in these cases, action and reaction being equal, the preacher can sometimes hear the critieisms of his audience, if any should he uttered tolerably loud in the proper direction. Besides whieh, a shell of this description would have had little effect in stopping tbe objectionahle echoes. To meet tbese difficulties, a curve was selected whieh has the property of distrihuting uniformly in every direction so mueh of the preacher's voiee as can he advantageously refleeted. The figure is hyperbolie, the axis being perpendicular over the preacher. The diameter is ten feet, and so much of the voice it receives is refleeted as if it came from a point about four feet from tbe preacher. It would be interesting to know, but I am not aware tbat sufficient experiments have been made to aseertain, what amount of sonnd is refleeted from a given material. The harder the material, obviously the better the result. In this case hard organ pipe metal has been used. I observed a marked increase of audibility of the voiee at a place where the assistance of the reflected sound is obtained over a point equidistant from the pulpit, but too high to receive tbe refleeted wave from tbe sounding board.—*F. C. Penrose.*

THE POPULAR "FORTUNE" HOT AIR FURNACE.

A hot air furnace that is designed to include all the good elements of the best styles of modern construetion, and is especially adapted for suburban houses, is shown in the accompanying illustration. It is manufactured by Messrs. Thomas, Roberts, Stevenson & Co., of Philadelphia, in four sizes, and has clinker-eleaning, shaking, and dumping grate, upright lever for shaking the grate, improved dust flue and check draft, improved cylinder, with and without drum heads, and extra large radiating surface, being durable and eheap, while economieal in use. These furnaces are made at a moderate priee, without any expense being put on for mere show, and thousands of them are in use in nearly all parts of the country.



THE FORTUNE HEATER.

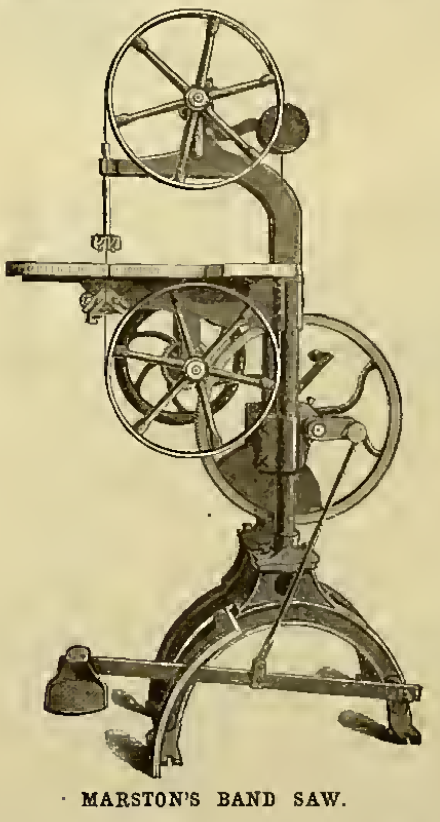
Not Defective Plumbing.

It many times so happens that plumbing is found a ready excuse for filthy people to place the blame upon "defeetive plumbing," while in reality it is other defeets that are the real cause. There are many things to take into consideration besides faulty plumbing. You should ask yourself: Is your cellar pure? How many germs of disease are lurking there because you have failed to properly drain and ventilate it, and remove the decayed vegetation and other impurities? And the well or spring; how much filth, unseen or unrealized though it he, is permitted to enter there, until at last it enters your life blood and becomes a part of your being, bringing you to an untimely grave?—*Plumbers' Trade Journal.*

AN IMPROVED HAND AND FOOT POWER BAND SAW.

A strong and well made hand saw machine, to be run by foot or hand power, is shown in the accompanying illustration, and is manufaetured by Messrs. J. M. Marston & Co., of No. 3 Appleton Street, Boston, Mass. The table is 18×21 inches and 42 inches high, and is adjustable for cutting on a bevel. There is an adjustable guide for the saw above and below the table, the saw pulleys are 16 inches in diameter, and the driving power is by means of gears, all shafts being of steel. The upper saw pulley has an adjustment to tighten the saw and bring it in line with the lower saw pulley. The power machines are from the same pattern, and are arranged with driving shaft and pulley on lower part of the frame, and tight and loose pulley on lower saw shaft, so that it can be belted direct from main shafting without counter shaft. The machine is a very easy-working one, cutting some four times as fast as a gig saw with less power.

The circular saw machine made by the same firm has its center part of iron, with grooves planed for gauges to slide in, which allows very fine and exact work to be done on the machine. There is a collar on the arbor,



MARSTON'S BAND SAW.

so that any endwise wear can be taken up, and the gears are accurately cut from solid iron. The aim of the manufacturers has been to make a simple, strong, accurate, and durable machine, such as can be put to hard work without injury, some of their saws having been in use for fifteen years without needing repairs.